COMMODORE USERS

Ahoy!

$2.95/ CAN. $3.35
APRIL 1988



Ahoy!

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VIEW FROM THE BRIDGE

Because this month's special announcements are *so* special that we don't want to risk your missing them, we're not going to go into them in the text portion of this page. Cleve Blakemore's *Grim Oak Manor,* a free bonus on the back of this month's *Ahoy! Disk*, merits its own box below. So does our reminder to subscribers about the change beginning next month, to an 8-issue *Ahoy!* and 4-issue *Ahoy!'s AmigaUser* format. And our joint venture with Firebird to send one lucky *Advanced OCP Art Studio* user/*Ahoy!* reader to Paris gets its own page (page 6).

Not that the contents of the April *Ahoy!* aren't special:

• Even if you're familiar with most of the *BASIC Obscurities* in this month's *Rupert Report*, Dale's examination of the neglected commands of BASIC 2.0 and 7.0 can serve as a valuable refresher course. (Turn to page 32.)

• Meanwhile, Dennis Furman provides you with a capability that BASIC 7.0's programmers left out: using windows to create animation effects in high resolution. His *Hi-Res Windows* can add just the touch your original C-128 program needs. (Turn to page 18.)

• Inspired in part by his daily commute through the "armpit of New York," Cleve Blakemore's *Time Subway* helps students of all ages acquaint themselves with over forty historical events while tracking a mad scientist through time. (Turn to page 47.)

• The generosity of *Ahoy!'s* game programmers know no bounds. First Cleve revealed some of his most guarded programming secrets in February's *Screen Wizardry.* And now John Fedor hands you *Sprite Exploder*—a routine that will add a truly professional touch to your original games. (Turn to page 22.)

• Richard Curcio's *Ahoy!* programming debut—*TextSave* (Jan. '88)—was a tough act to follow. So tough that it took him three months to come up with a similarly exceptional second effort. But it's arrived, in the form of *IRQ Messenger,* interrupt-driven programs for wedging into the 64 or 128's processing to insert your own routine. (Turn to page 13.)

• On the subject of long waits—five months between Tony Brantner programs is, we agree, excessive. But Tony returns with this month's *Barricade,* in which your only defense against rampaging robots is trapping them in makeshift structures. (Turn to page 16.)

• One of the true constants in the microcomputing world is the 1541 disk drive—just as slow in 1988 as it was in 1983. What have changed are the third-party products for speeding up the drive—they're getting better all the time. This month, Morton Kevelson and Donald Graham report on the latest generation of 1541 accelerators. (Turn to page 57.)

• If you've switched from an Amiga 1000 to a 500 or 2000, Richard Herring helps you overcome the *Printer Port Blues* by adapting that connector to fit your 1000-compatible peripherals. (Turn to page 55.)

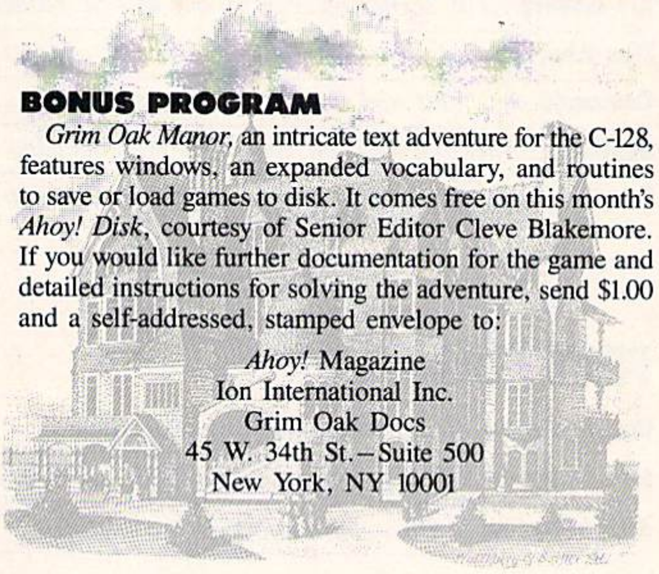
We're sure that all the Amiga owners in the audience will be back next month, when *Ahoy!'s AmigaUser* premieres. For our 64- or 128-specific readers, *Ahoy!* will return with the June '88 issue (on sale May 3). Whether we meet again in 30 or 60 days, we'll be knocking ourselves out for you in the meantime. We hope it shows. *—David Allikas*

SUBSCRIBERS, PLEASE NOTE

Unless we hear otherwise from you, you will begin receiving *Ahoy!* on an 8 issue per year basis. You will receive the number of issues your subscription calls for, spread out over a greater period of time.

Every third month beginning with May 1988, *Ahoy!'s AmigaUser* will appear instead of *Ahoy!* You will not receive these issues unless you request them. If you wish to receive *Ahoy!'s AmigaUser* in addition to *Ahoy!*, or instead of *Ahoy!*, you must contact our subscription service at *Ahoy!*, P.O. Box 341, Mt. Morris, IL 61054-9925 (phone: 815-734-4151).

BONUS PROGRAM



Grim Oak Manor, an intricate text adventure for the C-128, features windows, an expanded vocabulary, and routines to save or load games to disk. It comes free on this month's *Ahoy! Disk*, courtesy of Senior Editor Cleve Blakemore. If you would like further documentation for the game and detailed instructions for solving the adventure, send $1.00 and a self-addressed, stamped envelope to:

Ahoy! Magazine
Ion International Inc.
Grim Oak Docs
45 W. 34th St.—Suite 500
New York, NY 10001

ERRATA

CRYPT OF FEAR (Jan. '88)

When certain diagonals are entered, *Crypt of Fear* craps out with a RETURN WITHOUT GOSUB ERROR IN 70. A correction to Line 1280 solves this problem.

```
1280 JY=FNJS(.):J=FNJF(.):IFJ=.THENONJYG
OTO1360,1370,,1390,1290,1290,,1380
```

Also, the word PRINT was misprinted as PRIT in Line 570. Enter PRINT to get the correct checksum.

POWER TO THE COMPUTERS (March '88)

The diagram and caption on page 14 was switched with the diagram and caption on page 30.

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Contents of Issue #43

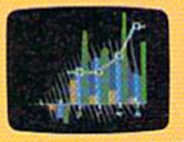
- **Expedition Amazon** *Complete* role playing game from Polarware!
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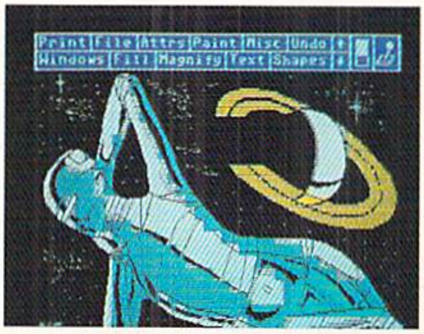
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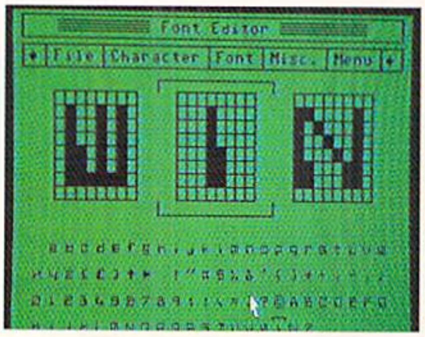
Firebird's *Advanced OCP Art Studio* has been heralded as the leading graphics package for the Commodore 64 and 128. And America's best amateur computer artists have been filling *Ahoy!'s Art Gallery* for years.

So what could be more natural than Firebird and *Ahoy!* combining to send some digital Dali to Paris to see the masterpieces of the Louvre museum?

The holiday of a lifetime, including roundtrip airfare and hotel, awaits the lucky reader who produces the best work with the *Advanced Art Studio.* But don't be scared off by the word "best"–in this case, it doesn't necessarily mean most professional. Entries will be judged on the basis of creativity, originality, and artistic merit, in that order—so it could be *you* sunning yourself on the banks of the Seine.

Send as many entries as you like, postmarked by June 1, to Firebird at the address printed below. For more information, call: 718-847-0234. *Bonne chance!*







OFFICIAL CONTEST RULES

1. First prize consists of round-trip air transportation to Paris, France, and hotel accommodation for one. No cash equivalent prize is offered unless the winner is below the age of 18 and his/her next of kin will not travel with him/her. Trip is subject to winner's French visa eligibility.

2. Fifteen runners-up will get their entries printed in the July 1988 issue of *Ahoy!*

3. All entries become the property of Firebird Licensees, Inc., with rights to include intellectual property rights and worldwide publishing rights. Firebird undertakes not to sell any entries for commercial gain.

4. Competition ends June 1, 1988. Neither Firebird nor *Ahoy!* are liable for entries postmarked after this date.

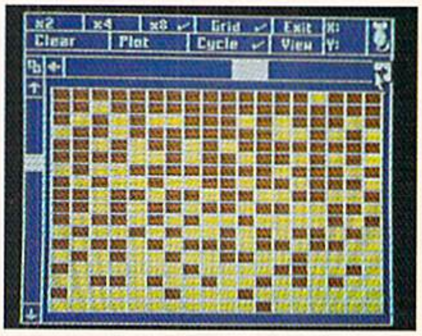
5. Judges' decision will be based on creativity, originality, and skill. Judges' decision is final. List of winners can be obtained by writing to AAS Winners, Firebird Licensees, Inc., 71 Franklin Turnpike, Waldwick, NJ 07463 after June 1, 1988.

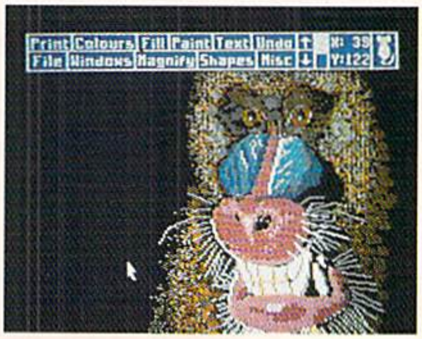
6. All entries must be submitted on Commodore-compatible disks as *Advanced Art Studio* files direct to Firebird at AAS Competition, 71 Franklin Turnpike, Waldwick, NJ 07463 or uploaded into the Firebird section of Q-Link. Include with entry the statement "The enclosed entry is entirely my own work. I hold the rights to its use, and guarantee that I have not infringed on any copyrights. I am legally entitled to pass on the rights for the use of my entry to Firebird Licensees, Inc. Signed, (name and date)." Neither Firebird nor *Ahoy!* can take responsibility for entries lost or damaged, whatever the cause.

7. Winners will be checked to insure that they are not connected with Firebird Licensees, Inc., its associates, or agencies, or with *Ahoy!* Magazine, its associates, subsidiaries, or agencies.

8. Competition is open to all residents of the United States and Canada. Competition is void where prohibited.







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VIDEO CUSTOMIZING SOFTWARE • C-128 CHIP REPLACEMENTS • EDUCATORS' NETWORK • PRINTING PROGRAMS • ONLINE TRAVEL AGENCY • GAMES FROM COSMI, DATA EAST, MICROPROSE, INTELLICREATIONS, EPYX • WIDE CARRIAGE PRINTER • CHILDRENS' ACTIVITY PACKAGE • EDUCATIONAL PROGRAMS

VIDEO COMBO

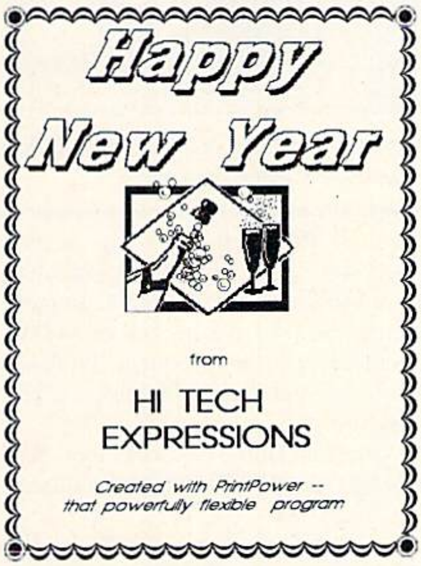
IntelliCreations' *Video Title Shop* VCR utility program and its *Graphics Companion 1* supplemental disk of 25 predesigned canvases, previously sold for $29.95 and $19.95 respectively, are now packaged together for $29.95.

IntelliCreations, Inc., 818-886-5922 (see address list, page 12).

HI TECH PRINTING

PrintPower ($14.95) lets C-64 owners create personalized greeting cards, invitations, multiline banners, tent cards, signs, posters, and the like. Line-by-line text editing is provided, as is an onscreen template for visualizing the item as it is created. The user can choose from 40 border designs, 60 graphic designs, and seven variations on six fonts. The program is compatible with graphics from Hi Tech's *AwardWare* program.

Hi Tech Expressions, 800-848-9273 or 305-584-6386 (see address list, page 12).





PrintPower ***includes 60 designs for use in signs, posters, flyers, and more.***

READER SERVICE NO. 216

ART HISTORY

Art Gallery: American History ($39.95) supplies *PrintMaster Plus* and *NewsMaster* users with over 300 graphics illustrating the nearly 500 years from the discovery of America to the present day. Included are all the states and presidents, plus historical scenes like the Pilgrim's landing at Plymouth Rock and the Scopes trial. An included timeline poster shows the graphics in chronological order.

Unison World, 418-848-6666 (see address list, page 12).

MATH/ENGLISH DRILLS

C-64 math and English programs:

Percent offers students practice in fraction/percent and decimal/percent conversions, mixed number percents, and percents with one or two decimal places.

Percent Word Problems presents real-life situations requiring students to find the percent of a number, to find a number when the percent is known, etc.

Essential Grammar covers common and proper and singular and plural nouns, verb tenses and agreement, adjectives and adverbs, and subject, object, and reflexive pronouns.

Essential Punctuation deals with end punctuation, periods in abbreviations and initials, commas, advanced commas, semicolons, colons, hyphens, apostrophes, and quotation marks.

Price of each disk is $44.95; with backup, $54.85; class pack, $164.95.

Gamco Industries, 800-351-1404 or 915-267-6327 (see address list, page 12).

VIDEO EFFECTS

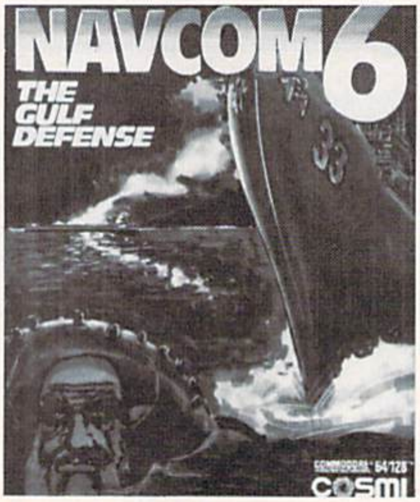
Home Video Producer ($49.95) lets C-64 users spice up home videos with special effects created from over 75 different graphics, 10 typefaces, and 8 borders. For example, a birthday segment could incorporate a birthday cake that appears in a spiral wipe; or a Halloween party could open with a witch riding her broom across a full moon.

Epyx, Inc., 415-366-0606 (see address list, page 12).

TRAVEL SERVICES

American People/Link has added airline reservation and travel-related shopping services to its online network. A joint venture of TWA and Northwest Airlines, Travelshopper lets subscribers view flight schedules and rates for all airlines, book reservations, and obtain other information such as weather, currency conversions, and mileage between cities. The Electronic Travel Agency sells discounted cruises and tours, as well as travel guides, maps, and other travel-related products.

People/Link's new rate for subscribers accessing through the direct number in Chicago is $3.00 per hour (down





Defend the USA's interests with blazing guns and international espionage in a pair of Cosmi releases. ***READER SERVICE NO. 223***

from $4.95), 24 hours a day, at any baud rate. The same rate is available to subscribers who connect prepaid through any of the packet networks. Members of the Frequent Plinkers Club ($10 per month) receive a 25% discount.

American Home Network, Inc., 800-524-0100 or 312-670-2666 (see address list, page 12).

NAMES OF THE GAMES

Two C-64 games from Cosmi:

The President is Missing! ($24.95), and the only clue is a single audio cassette left behind by his terrorist abductors. The tape contains the kidnappers' demands, and information to help the player unravel the mystery. With the aid of the central computer of the Counter Terrorist branch of the C.I.A., you search for clues to identify subjects and evaluate information.

Navcom 6: The Gulf Defense ($24.95) puts you in charge of the futuristic Weapons Control Center of a US Navy warship patrolling the Middle East. You'll escort tankers through the straits of Hormuz, receive telemetry from airborne AWACS and navigational satellites, detect destroy mines in the shipping lanes, and defend against high-speed boat raids. Finally, you'll confront the Ayotollah's main strike force and battle surface ships, submarines, and incoming Exocet jet aircraft.

Cosmi (see address list, page 12).

Based on the bestseller by Tom Clancy, *Red Storm Rising* ($39.95) focuses on the tactical operations of an American nuclear attack submarine in World War III. The sub's futuristic features include sonar that can identify ships by the sound of their propellers, computerized databases that list the speed and weaponry of enemy vessels, and torpedoes that can turn and home in on their targets. The player's tactical success and failure has a realistic effect on the strategic progress of the war. For the C-64.

MicroProse, 301-771-1151 (see address list, page 12).

A second Tom Clancy novel finds its



The Hunt for Red October *begins off the coast of Iceland, where you must elude NATO attack subs who don't know you plan to defect.* *READER SERVICE NO. 229*

way to the computer screen in Datasoft's *The Hunt for Red October*, casting the player as Soviet submarine captain Marko Ramius. Ramius wants to defect to the US and take his state of the art vessel, Red October, with him. His goal is to rendezvous with the American Navy, fake a radiation leak so that he can evacuate the crew, and smuggle the ship into a US port. The 113-man crew must be kept unaware of the defection plan, and contact with Soviet, US, and NATO subs must be avoided. $39.95 for the C-64; $49.95 for the Amiga.

Datasoft, 818-886-5922 (see address list, page 12).

The following from Datasoft's IntelliCreations division:

Controlling one of three different *BattleDroidz*, the gamer battles the residents of a faroff planet. The warzone is a series of interconnected hexagons, each with different challenges; to win, a row must be completed across the screen. For the C-64 ($24.95) and Amiga ($34.95).

An invasion force from the planet Nono threatens *The Rubicon Alliance* of the eight planets of the Hyturian Star System. As pilot of the legendary Starfox space fighter you undertake an eight-stage mission that will lead to the location of Nono and a final confrontation. For the C-64; $19.95.

The job of the *Global Commander* is to coordinate the satellite network orbiting earth. This involves monitoring each of the 16 United Nuclear Nations and preventing destruction of the planet while making sure each country has a sufficient supply of raw materials, food, and weapons for its own protection. For the C-64 ($29.95) and Amiga ($39.95).

Alternate Reality–The City will be made available in an Amiga version for $39.95.

IntelliCreations, Inc., 818-886-5922 (see address list, page 12).

From Epyx for the C-64:

Set in the Rocky Mountains above Calgary, *The Games–Winter Edition* ($39.95) lets athletes compete in Ovaltrack Speed Skating, Downhill Skiing, Slalom, Luge, Ski Jump, Figure Skating, and Cross Country Skiing. Included are camera-angle points of view to give the feel of network coverage.

As the senior detective in charge of the *L.A. Crackdown* ($39.95), you direct a rookie on the trail of a major drug ring. You instruct him in photographing clues, planting bugs, and tailing and questioning suspects, then follow his actions through the video monitors in your surveillance van.

Sporting News Baseball ($39.95) lets players choose from among 26 major league teams or create their own by mixing new players with over 100 stars of the past. Managers can steal bases, pick off runners, throw brush back pitches and more–however, all action is determined by the actual capabilities and statistics of the ballplayers.

Impossible Mission II ($39.95) finds evil mastermind Elvin holed up in a fortress filled with destructive devices. The player must maneuver through tunnels, avoid surveillance cameras, dodge robots, and somersault over time bombs as he collects the code numbers that will provide access to the control room.

4 x 4 Off-Road Racing ($39.95) lets players choose their own rigs and outfit them with the equipment they'll need to negotiate hills, bog through mud holes, and overcome heat and freezing cold–plug the renegade "demon" truck bent on their destruction. An Amiga version is planned for the second quarter of '88.



Speed Buggy allows the player his choice of five tracks, each with more difficult terrains, sharper curves, and more obstacles than the previous one. The race must be completed within a predetermined time limit.
READER SERVICE NO. 230

Street Sports Soccer ($39.95), played on a slippery grass field or a city street, requires controlling passes, heading the ball, and executing intricate slices and hooks. The three-man teams are selected from a neighborhood cast of characters, each with unique personality and skills.

Death Sword ($24.95), previously available in Europe as *Barbarian,* challenges younger gamers to outduel the guards of the sorcerer Drax, who holds the Princess Mariana captive.

Epyx will distribute games from Britain's U.S. Gold in United States, beginning with the following:

Dive Bomber compels players to earn how to take off from and land on an aircraft carrier in order to battle German fighters, track and destroy U-boats, and dive bomb E-Boats and mine fields. For the C-64 and Amiga; $34.95.

Street Cat faces off felines in four athletic events: crawling, jumping, somersaulting, and running through the park; leapfrogging over floating platforms in the arena pool; crossing the city sewers; and bowling at the local hangout against the Bulldog. For the C-64 and Amiga; $24.95.

Metocross sends the player on a one-man obstacle race, with such barriers as rats, hurdles, potholes, and green slime tiles distributed among 24 difficulty levels. For the C-64; $24.95.

Epyx, Inc., 415-366-0606 (see address list, page 12).

Two $29.95 games from Data East for the C-64:

Kid Niki sends the ninja adventure fan on a quest to rescue his girlfriend, Princess Margo, from the Stone Wizard. The sword-equipped player must battle dragons, monsters, and warriors on seven different levels, with a Big Boss at the end of each level blocking his advancement.

The *Speed Buggy* racing simulation whips the player around one of five

VSI BANK CARDS SAME AS CASH

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Drive/printer, 18 ft. 6 pin male/male	B618	$12.95
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Monitor, 6 ft. 5 pin to 4 RCA plugs	M654	$ 5.95
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Joystick ext. 9 pin, 12 ft. male/fem.	JS12	$ 4.95
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Joystick Y, 9 pin, 1 male/2 female	RJSY	$ 3.95
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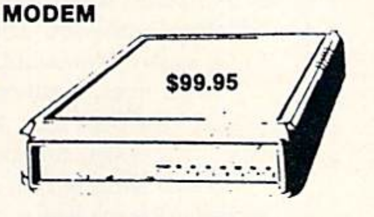
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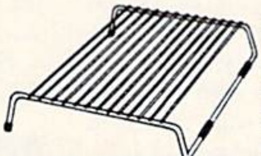
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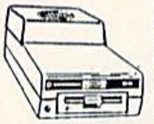
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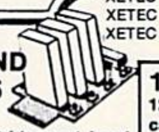
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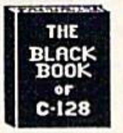
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tracks, each featuring progressively difficult terrains with sharper curves and additional obstacles. The object is to finish as fast as possible, while avoiding fallen trees, boulders, and more.

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LEARNING CENTER

CALC, the Computer Assisted Learning Center, serves as a resource center for parents, students, and teachers interested in using their Commodore computers for educational purposes. The $15 annual membership fee buys 12 monthly newsletters and access to "low-cost" disks of public domain educational programs for the 64, 128, and Amiga. CALC is eager to receive articles, reviews, and letters from readers for publication in their newsletter.

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Okidata, 609-235-2600 (see address list, this page).

KIDS' COLLECTION

The Computer Club ($14.95) comprises a number of C-64 programs for children aged 7-12, including word processor, address book and calendar, calculator, secret message encoder/decoder, a start-your-own-club kit, and a slide show of animated cartoons.

Hi Tech Expressions, 800-848-9273 (see address list, this page).

Companies Mentioned in *Scuttlebutt*

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Datasoft
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Redwood City, CA 94063
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Free Spirit Software, Inc.
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LaGrange, IL 60525
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Gamco Industries, Inc.
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Phone: 800-351-1404; in TX 915-267-6327

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IntelliCreations, Inc.
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MicroProse
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Phone: 301-771-1151

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Mt. Laurel, NJ 08054
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Berkeley, CA 94704
Phone: 415-848-6666

IRQ MESSENGER

Interrupt-Driven Memory Manager for the C-64 and C-128



By Richard Curcio

Maybe you've seen word processors or other programs that display a command or status line at the top of the screen, no matter how the rest of the screen scrolls. You may have asked yourself, "How do they do that?"

One method of performing this and a number of other useful tasks is to use an interrupt wedge, a routine which 60 times a second takes data from one location in memory (the source) and moves it to another location (the destination). By changing the IRQ vector at $0314-$0315 to point to a machine language program, another task can be "wedged" into the interrupt processing.

THE LOADERS

The first listing on page 80 is the BASIC loader for *Messenger64*. As written, it POKEs the machine language into location 51200 on the C-64. The C-128 listing on page 80 POKEs *Messenger128* into location 3072 on the C-128. Both routines can be located elsewhere by changing the variable MS in line 110. The loader(s) will make the necessary adjustments to relocate the ML and report the range of memory occupied. Enable the wedge with SYS MS where MS is the beginning address. The *Messenger* wedge preserves the original contents of the IRQ vector and may coexist with another IRQ altering program. *Messenger* will be disabled by RUN STOP/RESTORE.

SETUP, C-64 VERSION

Messenger provides four "boxes," flags that signal the microprocessor that data is to be moved during IRQs. The boxes are numbered 0-3. Each of the boxes has a source address (SA), destination address (DA), number of bytes (N), and a once/ continuous flag. These conditions are set up by SYS MS + 3, where MS is the address used to enable *Messenger.*

```
SYS MS +3, B, SA, DA, N
```

Box B indicates that N bytes from location SA are to be moved to location DA every interrupt. Value N is the number of bytes −1. A zero would move one byte and 255 moves 256 bytes, the maximum. If bit 7 of a box is set, the move takes place just once, so SYS MS +3, 2 OR 128, 828, 1024, 20 moves 20 bytes from the cassette buffer to the top line of the screen only during the next IRQ.

```
SYS MS +3, B
```

This statement clears the specified box. Once a box has been cleared, it can only be reactivated by specifying SA, DA, and N.

```
SYS MS +3
```

This statement clears all boxes. No movement of data will take place during IRQs. Although there is no SYS to disconnect the wedge, this statement effectively turns it off. If *Messenger* is disabled by RUN STOP/RESTORE, when reenabled by SYS MS any boxes that were active will immediately begin moving data, unless they had had a "once" flag. If you do not want this, use one of the box-clearing statements before SYS MS. *Messenger* doesn't have to be enabled to use the setup SYS.

The C-64 demonstration program assumes *Messenger* is located at 51200 and enabled. A short message is POKEd into the cassette buffer, followed by ones which *Messenger* will move into color memory. Two boxes are set up in continuous mode, and the message stays in place as the screen scrolls.

C-128 SETUP

As with the C-64 version, *Messenger128* is enabled with SYS MS. Because of its many banks (actually configurations), the C-128 architecture is more complex than that

of the C-64. In addition to the parameters needed for *Messenger64*, the 128 version requires a source bank (SB) and destination bank (DB). This makes for a fairly long statement, but one no worse than a CIRCLE or BOX command.

```
SYS MS +3, B, SB, DB, 0, SA, DA, N
```

Box B will move N bytes from address SA in Bank SB to address DA in Bank DB. The zero *must* be present in the position indicated. This insures that none of the status register bits are set. If bit 7 of box B is set, data movement takes place for one interrupt only. If DA or N are missing, a SYNTAX ERROR is generated. If nothing comes after the SYS address, or after the fourth parameter (the status register), all boxes are cleared. To clear just one box, use SYS MS +6, B.

The setup routine calls the Kernal GETCFG routine to get the MMU values for the source and destination banks and saves those values for use during IRQs. This way the wedge doesn't have to get new MMU values via GETCFG twice for each byte moved. Since the ROM portions of INDFET and INDSTA perform this step, they can be skipped and *Messenger* instead JSRs to the portions of those routines in "common" RAM at $02A2 and $02AF respectively. This saves some time. Still, if any box is continuously moving bytes, a split screen causes the computer to lock up, except for RUN STOP/RESTORE or reset. Continuous mode is therefore incompatible with split screens. The once option can be used with a split screen, though the screen will briefly revert to all text. Continuous mode is compatible with a full screen bit-map, however.

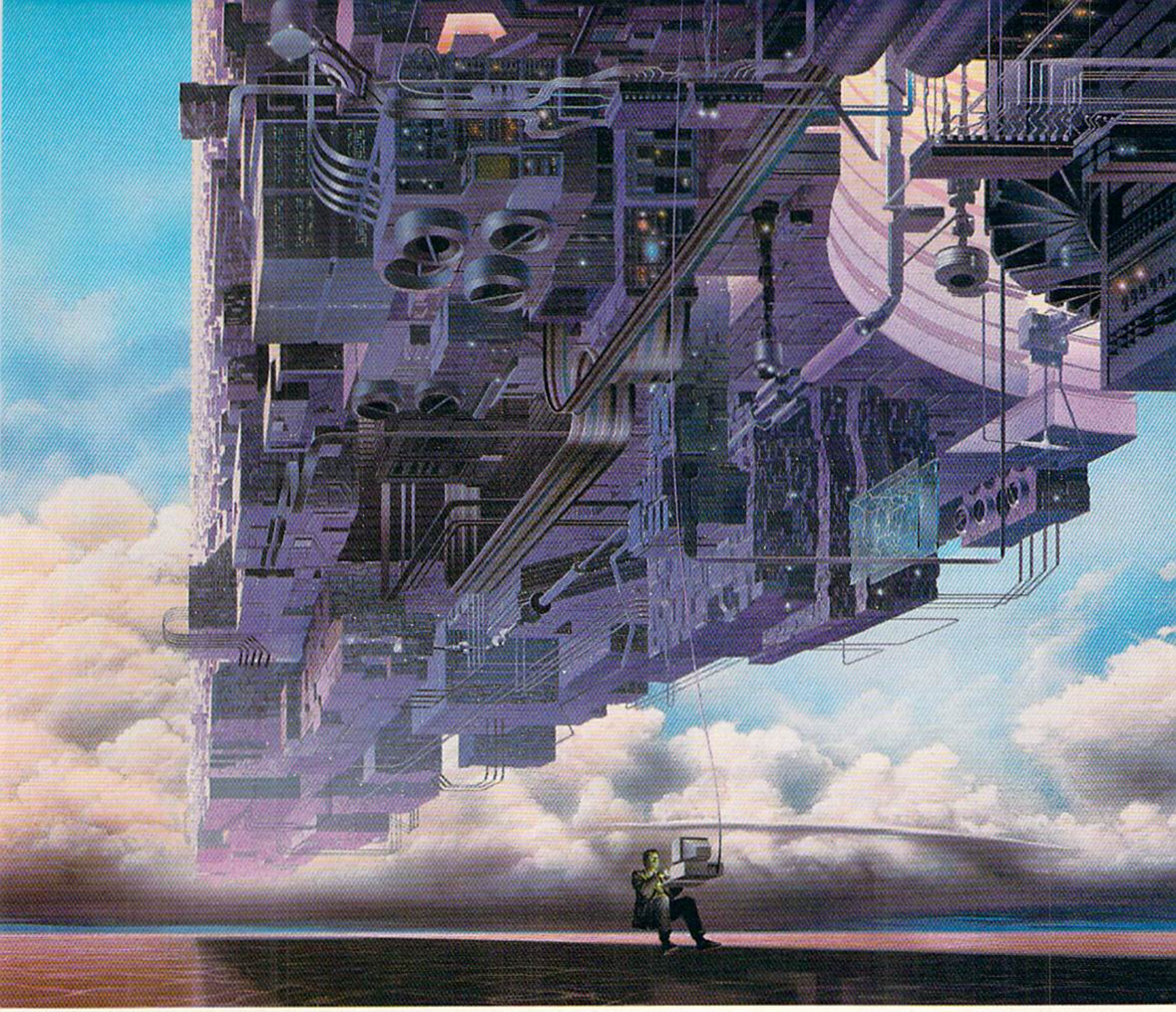
Both versions of *Messenger* temporarily use the free zero-page locations 251-254 during the IRQ, saving the original contents and restoring them before continuing to the "main" interrupt handler. *Messenger128* additionally saves the INDFET and INDSTA address pointers. If RUN STOP/RESTORE should occur while an IRQ is in progress, the original contents of these locations may not be restored.

WHAT'S IT GOOD FOR?

Admittedly, the command line example at the beginning of this article is a rather mundane application. *Messenger* can be put to other uses. Specifying one of SID's read-only registers, say voice 3 waveform, as a source, and a write-only register such as the filter high byte as destination, music could have the well-known (and well-worn) "wah-wah" sound. A more ambitious project would be to provide the C-64 with a system of "shadow registers," like the C-128. Using the "once" option, the routine can be used for block moves, perhaps to redefine sprites or call up help screens. The C-128 demo program illustrates block moves by calling the routine 32 times to fill a bit map with 8192 bytes from ROM.

As the number of bytes continuously moved increases, BASIC slows down noticeably. This is because the interrupt handling takes longer, and BASIC has less time to execute between interrupts. The C-128 becomes especially sluggish, and it may take several seconds for the slow motion cursor to reappear after pressing RETURN on a command. The speed of music and sprite motion will be affected as well. □

SEE PROGRAM LISTINGS ON PAGE 80



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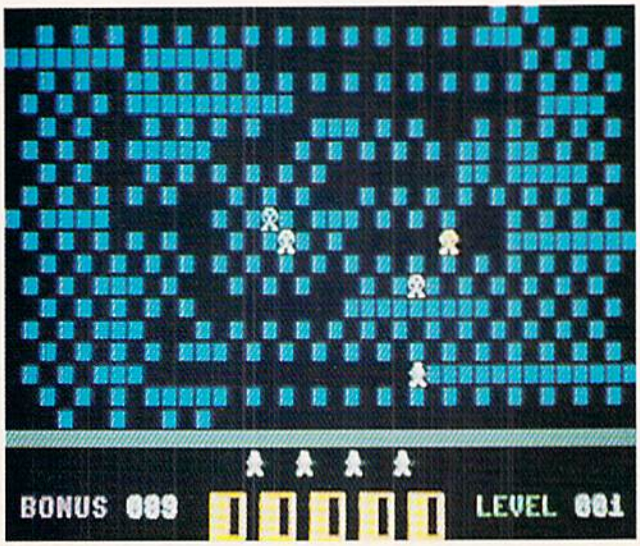
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For the C-64

By Tony Brantner



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Electronically Guided Homing/Exterminating Devices. Your fellow workers in the research plant jokingly refer to them as "Eggheads" for short. These robotic watchdogs roam the complex after hours, searching out and destroying intruders – no questions asked. Because of a malfunction in the computerized security system, the entire complex has been locked down. There are no entrances and no exits. But you have bigger problems right now. The Eggheads have been activated, and are tracking what they think to be an intruder – you. Because of the delicate equipment used in the building, the Eggheads have been programmed to change direction when something is in their path. By moving the equipment around, you can create makeshift barricades to hem them in. This is your only chance for survival!

Be sure to have a joystick plugged into Port 2 before playing. At the start of the game, you are given the opportunity to select the number of robots (Eggheads) tracking you. Move the joystick to the left or right to choose a highlighted number from 4 to 8. Naturally, the more robots you select, the harder the game is. Press the fire button to begin.

The robots are placed around the edges of the playfield, while your character is positioned in the center. Blocks, which are scattered around the playfield, can be pushed together to form walls. To trap a robot, surround it with walls, leaving it unable to move. Of course, each robot is programmed to kill – so don't get too close!

Once all the robots have been captured, you are awarded 100 points apiece. There is also a bonus timer at the lower left of the screen which counts down from 100 to 0 during each level. If there is any time remaining, it is also added to your score, located at the lower center of the screen. You will then proceed to the next level, which is a little faster.

Remaining lives are shown above the score as figures. You begin the game with four lives. Each time you are caught, you lose one and replay the level. The game ends when you've run out of lives.

Strategy plays a key role in *Barricade.* Although the robots are homed in on your coordinates, they can often find openings that aren't easily noticed by the player. Try to confine them to a large area, then cut it down a little at a time. Trapping them along the boundaries is much easier (and safer) than trapping them in the middle of the screen. You can use the SHIFT-LOCK key to freeze the game.

You'll need *Flankspeed* (page 69) to type in and save a copy of *Barricade.* After loading the program, enter SYS 49152 to play. ☐ *SEE PROGRAM LISTING ON PAGE 78*

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HI-RES WINDOWS

For the C-128

By Dennis Furman

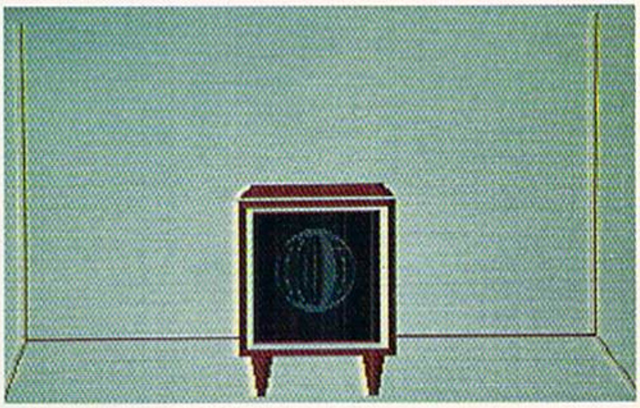
The Commodore 128 is an excellent machine for those of us who enjoy dabbling in high resolution graphics, but it lacks a number of features found in other home computers. Among these features are windows, viewports, and hidden screens for page flipping routines. The MOVSPR and GSHAPE commands offer only a limited capability to create animation effects on the hi-res screen. MOVSPR is useful for animating only small objects and GSHAPE is too slow for larger objects. The program described here provides a way to use rapid partial screen animation for nearly full size screen areas.

Hi-Res Windows is a machine language utility that can be used with BASIC programs to add windows to the hi-res screen for limited animation effects. Once you have saved a correct copy of *Hi-Res Windows,* run it and answer the prompts.

First you will be asked to enter the coordinates of the upper left hand corner of the desired window. Since only whole color cell areas are allowed, enter this information as column and row data. The columns run from 1 to 40 and the rows from 1 to 25. If you want to run the demo program, answer 17,10 for this prompt. Next, enter the width of the window in columns and the height in rows. Use 8 and 6, respectively, for the demo. This information will be used to customize the ML code to provide a window of the specified proportions and position. *Hi-Res Windows* will then BSAVE the ML data to disk using the filename "WINDOWS.OBJ". You can load this object code at any time using the BLOAD command, but it is non-relocatable. Since it is self-modifying code, it must always be loaded into the cassette buffer at 2816.

With the object code in place, the various window functions are activated by SYSing to three locations. SYS 2816 will clear the contents of the window by placing zeros in the appropriate hi-res screen memory. Color memory is untouched. SYS 2866,A will save the contents of the window and place it in BANK 0, page A (memory address of page A is found by multiplying A by 256). BANK 0 is used since it shares the lower 16K of memory with BANK 15 and has plenty of RAM available to store data-intensive screen displays. Care must be taken, however, to ensure that the pages used for window data do not overwrite your BASIC program code, also located in BANK 0. One way to find the lowest value of A that will ensure an uncorrupted source code would be to use the following line in direct mode after your program is complete:

```
A=INT((PEEK(4624)+256*PEEK(4625))/256)+1
:PRINT A
```


PHOTO: MICHAEL R. DAVILA

This line computes the nearest page boundary above the END OF BASIC.

SYS 2956,A recalls from BANK 0, page A the previously saved data. In order to set up an animation sequence, first draw the contents of each window, then save them individually using SYS 2866,A. Once this has been done for the desired number of windows, the entire data area can be BSAVEd to disk for later reloading by the animation program. The short demo program illustrates one way of creating a series of animation frames. Once begun, it will run indefinitely, so hit any key to stop when you have seen enough.

A few final words of caution when setting up the window data. First, limit the width of any window to 31 columns or less. While this restriction may seem inelegant, it keeps the program simple and provides a window large enough for most simple animation routines. Second, you will have to determine how many pages of BANK 0 memory is needed for each window. To do this, multiply the width times the height times 8. Divide the result by 256 and round up. For example, a window that is 10 columns wide and 8 rows high is made up of 10 x 8 x 8, or 640 bytes. This will require 640/256 or 2.5 pages for storage. Since each storage location called in the SYS command falls on a page boundary, you would use an increment of 3 for each new window stored or recalled.

Hi-Res Windows is obviously not the answer to all your animation needs, but it, along with the resident BASIC 7.0 commands, should help you achieve some fairly impressive results. ☐ ***SEE PROGRAM LISTING ON PAGE 74***

ART GALLERY



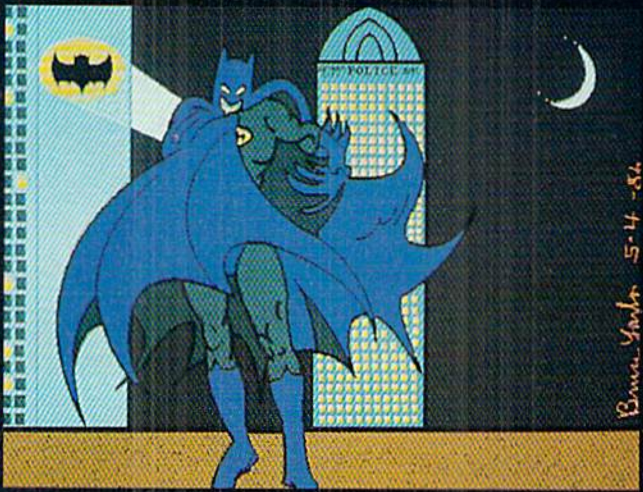
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Selected *Art Gallery* images are available on disk. Multicolor images are supplied in *Koala* format, while high-resolution images are in *DOODLE!* format. Included are a slide show for easy viewing, along with a bit map dump for your 1525 printer or properly interfaced equivalent. A sample *Art Gallery* disk with slide show and printer dumps is $10; or send a stamped and self-addressed envelope (business size) for a listing of available *Art Gallery* collection disks. Prices shown are for US and Canada. All others add $3 per disk. New York State residents please add appropriate sales taxes. Disks may be ordered from Morton Kevelson, P.O. Box 290260, Homecrest Station, Brooklyn, NY 11229-0005.

Contribute to Ahoy!'s Art Gallery

The *Ahoy! Art Gallery* offers the opportunity for fame and fortune to any and all aspiring Commodore artists. Simply send Morton (see address above) your work on disk indicating the drawing package or file format of the images. Inclusion of a self-addressed post card will guarantee an immediate response. All graphics produced on the C-64/C-128, Plus/4, and Amiga computers are eligible. If your image is published, you will receive a free one-year subscription to *Ahoy!* If you are already a subscriber, your subscription will be extended by one year.

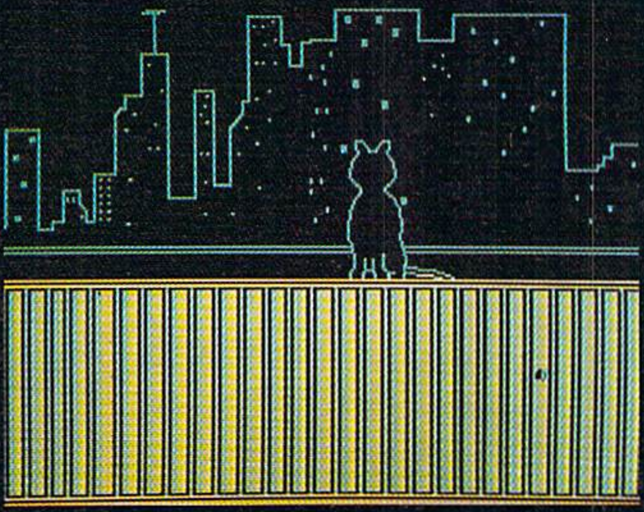
Note that the *Art Gallery* is not a contest. Published pictures are selected in an arbitrary and capricious fashion by the *Ahoy!* Art Director based solely on the artistic merit of the individual images.











While most artists favor bucolic landscapes over urban cityscapes, those concrete canyons in which many of us live or work have a beauty all their own—as this month's contributors make clear. At extreme left is *The Batman,* rendered by a fellow Bruce—Bruce Yarbor (Oklahoma City, OK). At immediate left is *Christmas*—see the world's oldest overnight delivery service silhouetted against the sky?—by Dale E. Clark (Flint, MI). Above is a smaller scale *City* by Leslie Clockel (Bellerose, NY). Top to bottom at right, there's a *View* through venetian blinds by David A. Grabowski (North Myrtle Beach, SC); a feline seen in a *Skyline Scene* by Barbara Tiess (Middletown, NY); and *Night* by Heinz Diekert (Vernon, BC)—along with *City,* one of this month's only two *Koala* images. The rest are *DOODLE!* drawings, with the exception of *The Batman*, sketched on the Amiga with *Deluxe Paint*. Holy 640 by 400 pixel hi-res mode!



SPRITE EXPLODER

For the C-64

By John Fedor

While creating your own special game, you may need to make a sprite explode. Suppose an enemy ship is shot. Some games just put dots on the screen, supposedly representing the ship's debris. Wouldn't it be more interesting and meaningful if the ship exploded from the center into smaller pieces? I think so. By use of this utility, your games will have a more professional touch as far as explosions go.

Sprite Exploder was created because I needed a robot to blow up into a bunch of little pieces and then come back together as a robot. The normal method of "cheating" wouldn't work, so I wrote this program to do the hard work for me. It can take up to 7 minutes for a complex explosion. But before we go into that, you need to enter the program on page 75 (a BASIC program with a bunch of numbers at the end). Once entered and saved, you can create your sprite shape(s) with your own editor and save them to disk. Now, run *Sprite Exploder*. Load your shapes by choosing the option 1. Now explode them by choosing the option 3. You now have to decide which shape you want to explode. By using the + and − keys, change the sprite so it is in the proper shape. Then press RETURN. Now choose which way you wish to go (increase or decrease from the original). You may have to allow some extra area between your shapes while creating them so you will have room for the exploded shapes to be next to them. For example, let's say you have a box at 255 and a dog at 254. Now you want to explode the box (did you think I was going to explode a dog?!), but the dog is in the way. So now you must use your original sprite editor to move the dog out of the way. You should leave up 12 blank shapes after the shape to be exploded. Also, the shape should be centered around the X and Y axes. This is because the program assumes that this is true.

Now that (hopefully) you are set up correctly, you can choose the number of explosion frames you wish to do. Twelve is a complete explosion, while one is the first step in a full explosion. A solid box takes 6.5 minutes to explode 12 frames. The more blanks in the shape, the less the time involved. Once the explosion is computed, the menu appears again. Choose the animation routine (Option 4). This allows you to watch the explosion happen. The adjustment of the speed occurs only while the shape is exploding. Once satisfied with your explosion, save it to disk (Option 2). The first sprite shape must be the lowest numbered sprite to be saved.

What happens next? Well, if you don't want all the frames used, delete a couple of frames (using your editor) and scrunch the sequence together (to replace the deleted frames). You would want to do this if you don't have a lot of memory to waste on a full explosion. Now incorporate the shapes into your game. See how nice it looks? It really does add a great effect to the game.

(*Ahoy! Disk* subscribers please note: the April 1988 *Ahoy! Disk* contains two sample explosions which we didn't have room to list in the magazine. To order the *Ahoy! Disk*, see page 46.—Ed.) ☐

SEE PROGRAM LISTING ON PAGE 75

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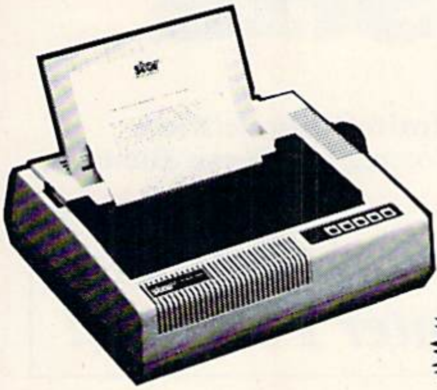
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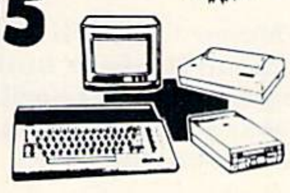
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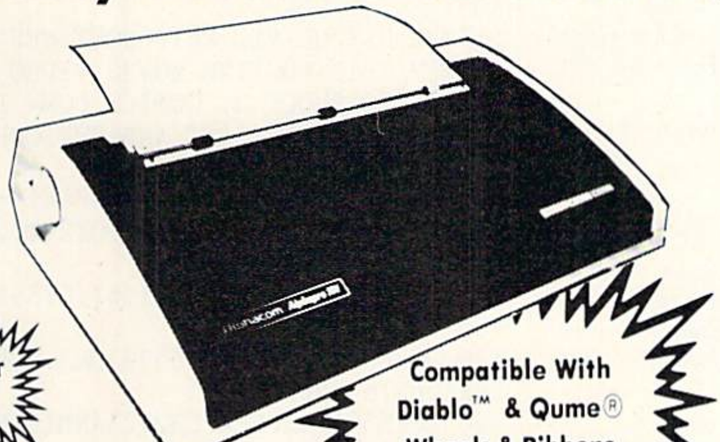
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TIPS AHOY!

Compiled by Michael R. Davila

Contributors to *Tips Ahoy!* will be compensated at highly competitive industry rates. Send your best programming and hardware hints for the C-64, C-128, or Amiga to *Tips Ahoy!*, c/o Ion International Inc., 45 West 34th St.–Suite 500, New York, NY 10001. Include a stamped and self-addressed envelope if you want your submissions returned.

QUICK QUIET DRIVE

Are you having those drive rattle blues? Is commercial software that makes your drive rattle driving you mad? Here is a one line program that will put a stop to that.

–Steve Cody
A.P.O. San Francisco, CA

```
·10 OPEN 15,8,15:PRINT#15,"M-R";CHR$(106)
CHR$(0)CHR$(1)CHR$(133)
```

LOWERCASE MOIRES

This program prints an interesting screen background using lowercase characters. Use it to spruce up a title screen or as a test background.

–Andrew Millen
Johnson City, TN

```
·10 REM LOWERCASE PATTERNS
·20 POKE53280,0:POKE53281,0
·30 PRINT"[CLEAR][c 4]";CHR$(14);:FORA=1T
0320:PRINT"[c *][c *][sEP]";:NEXT
·40 GETA$:IFA$=""THEN40
·50 PRINTCHR$(19)
```

GOODBYE MR. CHIPS

The VIC chip terrifies beginners. It seems to be a maze of Sanskrit that requires a PhD in computer science just to go into extended background mode.

For example, many programmers would like to take advantage of all that safe, bountiful memory available in block 3 at 49152 and above–but they're scared of crashing the machine, copying down the character set incorrectly, or setting up the Video RAM and losing the cursor.

Stick these routines in your library and say goodbye to VIC hassles forever.

The first copies down the character set to the RAM at 61440 using the built-in memory move subroutine, then sets the Video Chip to block 3 and finally clears the screen and introduces the cursor. It takes one second total. No sweat, no fuss. And now you've got room for about 64 sprite shapes with no loss of BASIC memory or having to worry about overwriting your own code. Just remember...if you hit RUN STOP/RESTORE, you'll have to type POKE 648,4 blindly to get the cursor back. Also, the sprite pointers are now at 50168-50175 instead of 2040-2047.

The second routine will copy any redefined character data down for you if you end it with a –1 to signal the subroutine to RETURN. Data should be in the standard screen code + 8 bytes format. The character set is in the hidden RAM at the top of memory, so it takes no space away from the sprites. What more could you want? –Cleve Blakemore

```
·10 GOSUB110
·20 REM GOSUB 160 IF YOU HAVE CHAR DATA
·30 END:REM SET UP IN BLOCK 3 NOW!
·40 :
·50 REM USEFUL VIC CHIP ROUTINES-BASIC
·60 REM THIS ROUTINE MOVES VIDEO MEMORY
·70 REM TO BLOCK 3, COPIES DOWN THE
·80 REM CHARACTER SET AND SWITCHES OVER
·90 REM THE SCREEN EDITOR
·100 REM SCREEN = 49152:CHARSET = 61440
·110 POKE781,9:POKE782,1:POKE90,.:POKE91,
216:POKE88,.:POKE89,248
·120 POKE56333,127:POKE1,51:SYS41964:POKE
1,55:POKE56333,129
·130 POKE56578,PEEK(56578)OR3:POKE56576,P
EEK(56576)AND252
·140 POKE53272,PEEK(53272)AND15:POKE648,1
92:PRINTCHR$(147)
·150 POKE53272,(PEEK(53272)AND240)OR12:RE
TURN
·160 :
·170 REM THIS SUBROUTINE READS IN AND
·180 REM POKES CHARACTER DATA UNTIL IT
·190 REM ENCOUNTERS A -1 IN THE DATA
·200 READA:IFA=-1THENRETURN
·210 FORX=.TO7:READD:POKE61440+A*8+X,D:NE
XT:GOTO200
```

BULGING SQUARES

By manipulating a character through the custom character set, you can create some interesting animation. To see what I mean, type in and run the following program for the C-64. It will take some time to copy the character set. Hit any key to end the demonstration. This technique can also be used on the C-128, although a different method of copying and enabling the custom character set must be used.

–Michael Jaecks
Alamogordo, NM

```
·5 PRINT"[CLEAR]PLEASE STAND BY.COPYING C
HARACTER SET."
·10 POKE52,48:POKE56,48:CLR:POKE56334,PEE
K(56334)AND254:POKE1,PEEK(1)AND251
·20 FORI=0TO2040:POKEI+12288,PEEK(I+53248
):NEXT:POKE1,PEEK(1)OR4
·30 POKE56334,PEEK(56334)OR1:DIMA(5,7):FO
RY=0TO3:FORX=0TO7:READA(Y,X):NEXT:NEXT
·40 B=2:FORY=4TO5:FORX=0TO7:A(Y,X)=A(B,X)
:NEXT:B=B-1:NEXT
```

Continued on page 81



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RUPERT REPORT

Someone once said that 90 percent of all software ever written uses only 10 percent of the available instructions in the corresponding programming language. I'm not sure that those numbers are accurate, but there is certainly some truth in the statement.

Every language has a few "work-horse" commands which make up the majority of each program. In BASIC, the most common instructions are undoubtedly LET, PRINT, IF-THEN, and probably GOTO. Each language also has its set of lesser-known instructions, which occasionally fall through the cracks of the programmer's repertoire.

This month we will recover some of the less-common BASIC instructions. If you haven't looked through your BASIC manual in a while, perhaps you have forgotten that some of these instructions exist. These commands are probably not used for everyday programming. They are generally reserved for those troublesome times when you just know there must be a better way to write that program.

I am sure that many of you reading my list of obscurity will say that you use some of these commands all the time. Great. Each one serves a purpose. The wider your programming vocabulary, the better your programs may be. Consider this article a refresh of your dynamic RAM. For newcomers to the language, file these commands away. Some day they may be just what you need.

LESS COMMON, STILL IMPORTANT

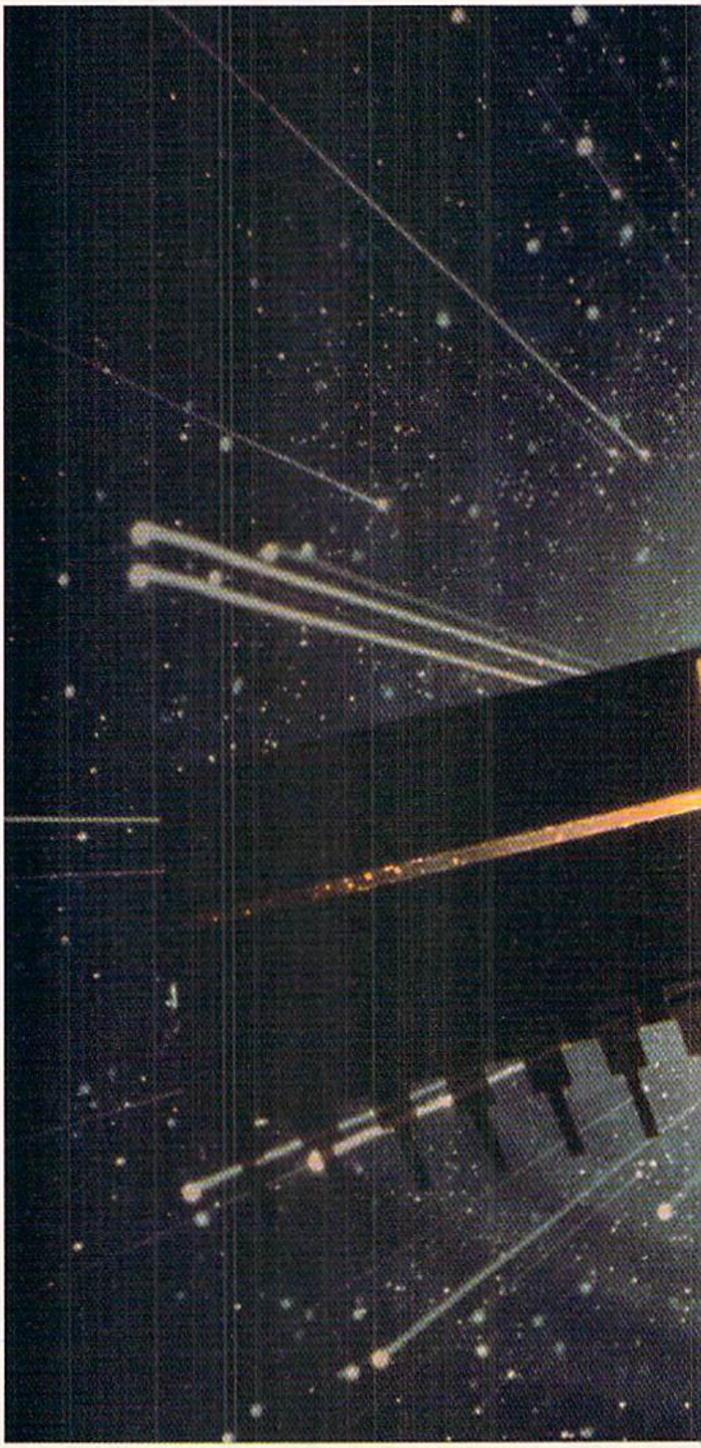
Looking through the list of commands I have selected as being considered "obscure," I find that most of them are in BASIC 2.0 on the C-64 as well as BASIC 7.0 for the C-128. That is rather surprising since BASIC 2.0 is a fairly "bare-bones" implementation of the language.

Let's start with the POS function. POS tells you the horizontal position of the cursor on the screen. If the cursor is at the tenth character position in the top line of the screen, POS(0) gives a value of 9 on the C-64 and the C-128. If the cursor is at the tenth character position in the next screen line down, POS(0) still returns 9 on the C-128, but it gives a value of 49 on the C-64.

Why the difference? The C-64 deals with 80-character "logical screen lines" however illogical that may be. Since the C-64 display is 40 characters wide, each logical line corresponds to two screen lines. When do you need the POS function? It is useful when variable length strings or graphics characters are to be printed all on one line. With the POS function, the program can decide whether there is enough room to begin printing at the current screen position or if the cursor should be returned to the left end of the next line to begin.

To print A$ at the current cursor position only if there is room for it on the line, try this (assuming a 40-column display):

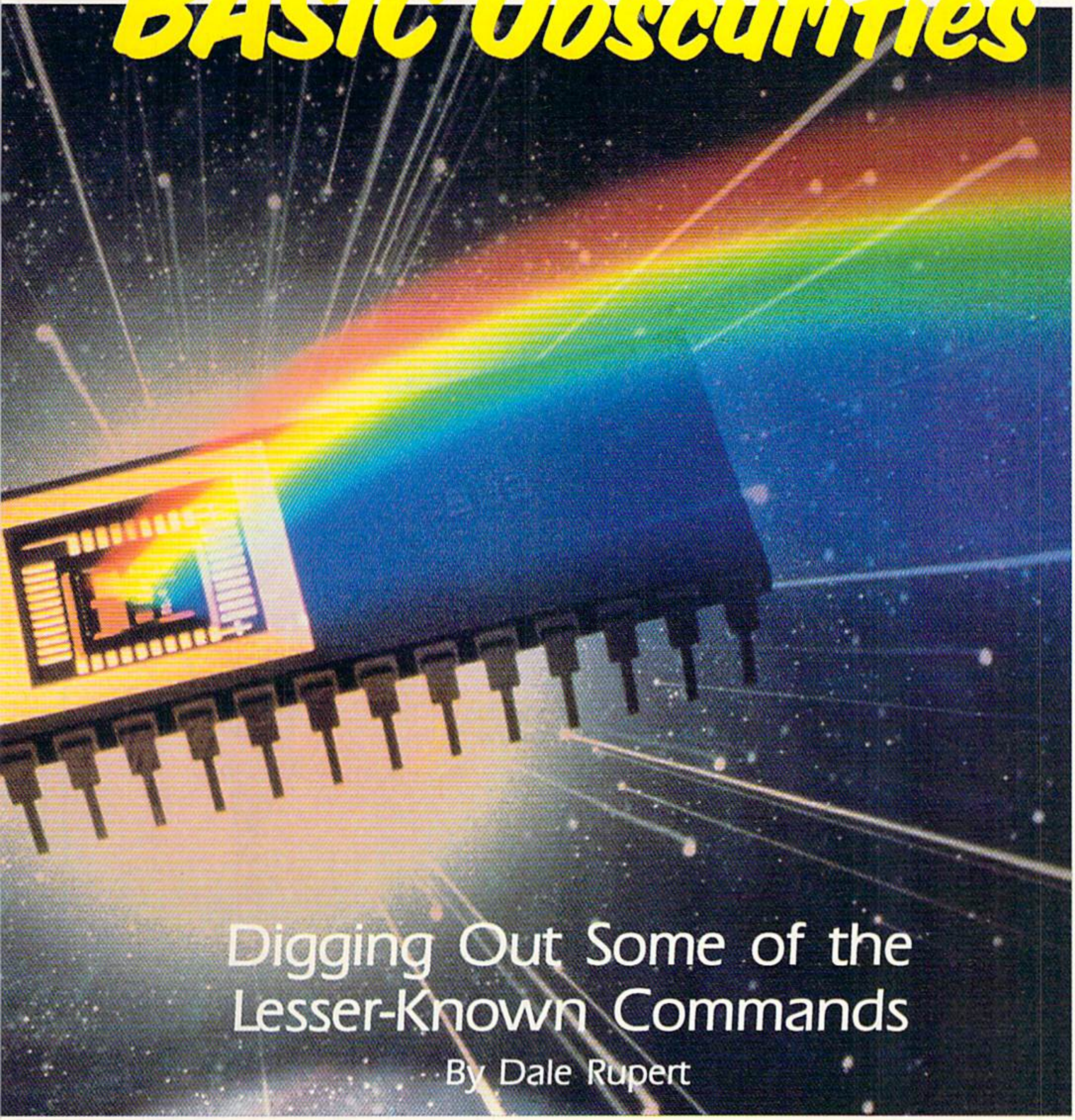
```
10 P=POS(0) : IF P > 39 THEN P=P-40
```



```
20 IF LEN(A$) > 40-P THEN PRINT
30 PRINT A$
```

Line 10 gives P the line position of the next character to be printed. The last part of line 10 corrects for the 80-character C-64's logical line "idiosyncrasy" (to put it politely). Assume the cursor is sitting at the last character position on the line, so P has a value of 39. If A$ is only one character in length, then it will fit on the line. If LEN(A$) is 2 or more, line 20 will execute an extra PRINT state-

BASIC Obscurities



Digging Out Some of the Lesser-Known Commands

By Dale Rupert

DON CARROLL / THE IMAGE BANK

ment which moves the cursor to the start of the next line. Line 30 puts A$ wherever the cursor happens to be.

By the way, the value of the argument in the POS function is irrelevant. To fit in with the standard syntax of the other BASIC functions, POS( ) needs something between its parentheses, but it doesn't matter what (within reason).

So POS tells us the horizontal position of the cursor. It seems that it would be equally useful to know the cursor's vertical position on the screen. What command gives the cursor's vertical position? Unfortunately there isn't one. You must PEEK into memory locations 214 (on the C-64) or 235 (on the C-128) to get that information.

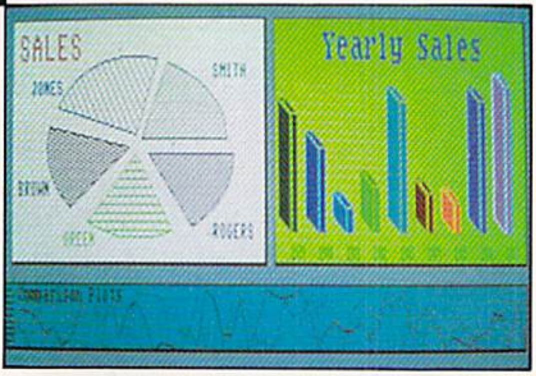
Much of the BASIC we know has its roots in the "teletype days," before computers had video monitors. Since the teletype machine was a sequential access device, it was not feasible to move the "cursor" vertically upward. In fact there was no cursor. POS was all that was needed to specify the horizontal position of the printhead on the paper.

Next on my list is the SPC command. POS tells the program where the cursor is on the line. SPC moves it over



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a given distance on the line. SPC is easily confused with the TAB command. The main difference is that SPC is a relative move whereas TAB is an absolute move. These statements generally produce different results:

```
10 PRINT A$; SPC(15); B$
20 PRINT A$; TAB(15); B$
```

Line 10 prints 15 spaces between A$ and B$ regardless of their lengths. Line 20 prints A$ then attempts to move the cursor to the 16th character position on the line before printing B$. (Why 16 and not 15? The left-most position on the line is considered position 0.) If the length of A$ is greater than 15, then line 20 causes B$ to be printed adjacent to A$ without any spaces between them. For that reason, TAB can be tricky to use.

SPC and TAB are moderately useful. Much more useful than either of these is the BASIC 7.0 CHAR command which allows you to specify the exact horizontal and vertical position to begin printing. (CHAR is not on my obscurity list since I use it frequently for screen formatting. Give it a try if you aren't already using it. The *Programmer's Reference Manual* states that it is mainly useful for graphics screens. It works fine on text screens as well.) CHAR can be used with POS to move the cursor a certain horizontal distance from its current position. It's too bad there's not a CSRLIN command to give the cursor's vertical position.

FREE MEMORY

FRE is a useful but somewhat obscure command. How often have you written a program that needs to know the amount of memory that is available to it? This is not a common problem, but it is one that FRE solves nicely. FRE(0) on the C-64 tells how much RAM is available for the program and its variables. It has a quirk that the value returned is between −32768 and 32767.

If you have 40,000 bytes free, PRINT FRE(0) displays a value −25536 on the C-64. You must add 65536 to any negative values to get the actual number. Using a logical expression to decide if the number is negative, this statement corrects the program:

```
PRINT FRE(0) - 65536 * (FRE(0)<0)
```

This expression in parentheses is zero if FRE(0) is positive or zero so it does not affect the results. If FRE(0) is negative, the expression (FRE(0) < 0) is true and thereby has a value of −1. Thus 65536 is added to FRE(0) whenever FRE(0) is negative.

The FRE argument can be any value for the C-64. The C-128 returns different values for arguments of 0 and 1. PRINT FRE(0) on the C-128 gives the amount of program storage available. PRINT FRE(1) shows the amount of unused variable storage. Programs and variables are stored in two different sections of RAM in the C-128.

FRE is useful for allowing the program to decide how large to make its arrays. Knowing that each element of a numeric array needs five bytes, a program could set up the maximum size array with the following sequence:

```
10 D = FRE(1)/5 - 10
20 PRINT D
30 DIM A(D)
40 PRINT FRE(1)
```

The 10 is subtracted in line 10 since some memory is needed to store the dimensions of the array in addition to the elements of the array. Normally you should leave a much larger margin than 10 bytes. If you want to see your C-128 go off into "Out of Memory" heaven, change the 10 to 2 in line 10. A word of warning: you will have to reboot your computer after this.

The C-64 handles the situation much better. You must replace the FRE(1) with the expression shown earlier for handling negative results. Line 10 should be

```
10 D = (FRE(1) - 65536*(FRE(1)<0)) / 5 -1
0
```

Change the 10 to smaller numbers. The size of the array increases while the amount of free memory decreases until the 10 has dropped to 2. At that time, a simple "Out of Memory Error in 30" is displayed, and unlike the C-128, the machine does not go berserk.

ON A TANGENT

When is the last time you used the ATN function? Do you know what the ATN function is? If you do, have you ever wondered why there isn't a corresponding ASN or ACS function?

The ATN function deals with trigonometry. It gives the angle in radians which is the inverse tangent ("arc tangent") of its argument. For example, an angle of 45 degrees has a tangent of 1:

$$\tan(45) = 1.0$$

Most of the time, BASIC does not work with angles measured in degrees. Instead it uses an angle measure called "radians." There is a simple relation between radians and degrees:

$$1 \text{ degree} = \text{pi}/180 \text{ radian}$$
$$\text{or } 1 \text{ radian} = 180/\text{pi degrees}$$

These relations come from the fact that a circle contains 360 degrees or 2 times pi radians, where pi is approximately 3.14. The relations are therefore simplified to

$$1 \text{ degree} = 0.01745 \text{ radian}$$
$$\text{or } 1 \text{ radian} = 57.30 \text{ degrees.}$$

To find the tangent of a 45-degree angle, we write:

```
PRINT TAN(45 * [PI] / 180)
```

The computer gives a result of approximately 1.0.

The ATN function is just the opposite of the TAN function. ATN(1.0) gives the angle (in radians) whose tangent is 1.0. Entering

```
PRINT ATN(1)
```

gives 0.785 radians. Multiply this by 57.30 to get 45 degrees. Or let the computer do the multiplying:

```
PRINT 57.30 * ATN(1)
```

So ATN is the inverse of the TAN function (just as SQR is the inverse of the <2 function and multiplication is the inverse of division). Why doesn't BASIC include inverses for the SINE and COSINE functions as well? The main reasons are that: 1) the trigonometric functions are fairly obscure (the majority of programs written get along quite well without them), and 2) the inverse SINE and inverse COSINE are easily derived from ATN.

Appendices in the reference manuals and the user's guides show the relationships between the various trigonometric functions. All I can add is an enhancement which I jotted down from a 1979 issue of a defunct publication *Interface Age.* Create these user-defined functions for the inverse cosine (arccosine) and inverse sine (arcsine).

```
DEF FNACS(X) = ATN(SQR(1 - X*X)/(X+(1-SG
N(X)*SGN(X)))) + PI/4 * ((1-SGN(X))*(1-S
GN(X)))

DEF FNASN(X) = PI/2 - FNACS(X)
```

Unlike the formulas in the appendices, these functions give correct results for positive and negative arguments. Enough said about the ATN function.

CONCATENATION

When is the last time you needed to concatenate two sequential files? I can't remember the last time I needed to, either. Just in case you must, call on the CONCAT function. This is available only in BASIC 7.0 on the C-128. C-64 users must use the "combine option" of the COPY command to duplicate this operation.

Unfortunately these commands are designed to work only with sequential files. They can't be used for something far more useful such as joining two program segments. The C-64 version of the "combine" command is more flexible than the CONCAT command. The syntax for joining sequential files SEQ1 and SEQ2 into the file named SEQ1 is either:

```
10 CONCAT "SEQ2" TO "SEQ1"
```

or

```
20 PRINT#15,"COPY0:SEQ1 = SEQ1,SEQ2"
```

With the BASIC 2.0 version (which can also be used in BASIC 7.0), the new file name can be different from the concatenated files if desired. Also, up to four files at a time can be joined using the statement in line 20. The file names to be joined must be separated by commas.

A related, but somewhat less obscure, BASIC 7.0 command is APPEND. This lets you open a sequential file so that more data may be added to the end of it as in line 10 below. BASIC 2.0 allows you to append data by opening the file with the "A" option as in line 20:

```
10 APPEND#1,"SEQ1"
```

or

```
20 OPEN 1,8,8,"SEQ1,SEQ,A"
```

Now data can be added to SEQ1 by use of the PRINT#1 command.

Why do you suppose that CONCAT and APPEND are included in BASIC 7.0, but a more useful command such as MERGE for program files is not? Probably because program files are more complicated. They include memory pointers as well as program text. A MERGE command would have to change all the pointers for the second program segment. (Some of you could write a utility to do that.)

INTERRUPTING INPUT

Just a tidbit for C-128 users who dislike their disability to break out of the INPUT command prompt by pressing RUN STOP. Hold down the RUN STOP key then press either the HELP key or the Enter key on the numeric keypad. (The normal Enter key is not seen when RUN STOP is being pressed.) Either of these keys inserts the CHR$ (13) that the INPUT command is awaiting even with the RUN STOP key held down. The RUN STOP key then halts the program. Any of your function keys which have been defined with a carriage return (CHR$(13)) at the end will also terminate the INPUT this way.

C-64 users might try some nimble-fingered gyrations to do the same thing. At the INPUT command question-mark prompt: 1) hold down the CONTROL key, 2) tap the M key, 3) immediately release the CONTROL and M keys, then 4) quickly press and hold the RUN STOP key. With some practice, you can successfully break out of the INPUT command. CONTROL-M is an alternate way of entering CHR$(13), the carriage return.

Here is a little program with which to practice these techniques on either machine:

```
10 INPUT X
20 GOTO 10
```

A BIT NEGATIVE

The NOT operator is next on my list of BASIC obscurities. NOT is used for logical operations and also for bitwise manipulations. For example, a standard way to define logical variables (in some cases called "flags") is this:

```
10 FALSE = 0
20 TRUE = NOT FALSE
```

Logical variables have one of two values, true or false. Logical variables can be used to keep track of program flow. Suppose you have a subroutine which may be called from several places within a program, but you want to make sure that the subroutine is executed only once, regardless of who calls it.

Initialize a logical variable DUN with the following statement:

```
30 DUN = FALSE
```



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You may set up the subroutine this way:

```
100 IF DUN=TRUE THEN RETURN
110 ... put routine here ...
...
180 DUN=TRUE
190 RETURN
```

Your program calls this subroutine with GOSUB 100. Line 100 checks the logical variable DUN to see if this routine has already been done. DUN is initially FALSE, so lines beginning with 110 are executed. When the routine is finished, line 180 sets DUN to TRUE and line 190 exits.

The next time this subroutine is called, the logical expression DUN = TRUE in line 100 is tested and found to be true, so the routine will be skipped because of the RETURN statement. Line 100 could be shortened to

```
100 IF DUN THEN RETURN
```

with the same results.

If you want to execute just part of the subroutine the first time through, and execute the rest of it all the other times, change line 100 to this:

```
100 IF NOT DUN THEN ... (first time only
) ... : GOTO 180
```

Only if "NOT DUN" is true will the other instructions in line 100 be executed. On subsequent calls to the subroutine, the "first time only" instructions in line 100 will be skipped.

NOT is also used for manipulation of numeric bits. For example,

```
10 A = 0
20 B = NOT A
30 PRINT B
```

will display the result −1. The NOT operator changes every 0 bit in a number into a 1 and vice versa. Since A is zero, think of it as 16 zero bits. The NOT operation in line 20 produces a value with 16 one bits: 1111 1111 1111 1111. This is the binary "two's complement" representation of the decimal value −1.

The ordinary binary value of 16 one bits is decimal 65535. The computer does not use ordinary binary notation. It uses two's complement notation. The leading 1 bit in two's complement notation means

1. Take the remaining 15 bits and invert each one.
2. Add a value of 1 to that answer.
3. Call the result a negative number.

Think of the left-hand bit as the "sign bit." A sign bit of 1 means the number is negative and must be converted according to the rules above. A sign bit of 0 means the number is positive.

Let's convert 1111 1111 1111 1111 to its decimal value. Follow the steps above.

1. Inverting each bit of 111 1111 1111 1111 gives 000 0000 0000 0000.
2. Adding 1 gives 000 0000 0000 0001 which is the binary representation of the decimal value one.
3. Therefore, 1111 1111 1111 1111 is the two's complement representation of the decimal value "negative one."

Consequently we have seen how NOT 0 is really −1.

Can you figure out the decimal value of 1111 1111 1111 0000? The leading 1 tells you the number is negative. To convert a negative number to its decimal value follow the steps above. You should end up with the value −16 (inverting 111 1111 1111 0000 gives 000 0000 0000 1111; adding 1 gives 000 0000 0001 0000 which is 16.)

If you tell the computer to PRINT NOT −16, the result is 15. Remember that NOT just inverts each bit. So 1111 1111 1111 0000 becomes 0000 0000 0000 1111, and that is the binary representation of 15 (2 ↑ 3 + 2 ↑ 2 + 2 ↑ 1 + 2 ↑ 0). Conversely PRINT NOT 15 gives −16.

WAIT A BIT

That summary of the NOT operator and the discussion of binary notation prepares us for the next obscure command, the WAIT instruction. Most of the references I have seen describe the WAIT instruction as a "limited-use command," not to be used for normal programming. Let's see what it does. Then you can decide if you have a need for it.

The syntax is WAIT MEM,A,X. The instruction causes the computer to look repeatedly at the contents of memory location MEM until the bits in the binary representation of MEM's value meet certain conditions defined by A and X.

Start with a simpler version of WAIT. Consider WAIT 211,1. On the C-128, the states of the SHIFT keys are stored as individual bits. (The corresponding memory location on the C-64 is 653. The statement is WAIT 653,1.) When this program is run, the computer sits at line 10 until you press either of the SHIFT keys.

```
5 MEM=211 : IF FRE(1)=FRE(0) THEN MEM=65
3
10 WAIT MEM,1
20 PRINT "NOW IN LINE 20"
```

Line 5 sets the value of MEM for the computer being used. (Recall from our discussion of FRE that the argument doesn't matter on the C-64, so FRE(0) always equals FRE(1) for that computer, and MEM is set to 653. On the C-128, the two arguments will generally return different results, so MEM retains the value 211.)

The various SHIFT keys have the following decimal and binary values:

	decimal	binary
Either SHIFT key	1	00001
COMMODORE key	2	00010
CONTROL key	4	00100
ALT key	8	01000
CAPS LOCK key	16	10000

The last two keys are only on the C-128. Think of MEM

as containing a 5-bit binary value 00000 through 11111. A bit value is one when the corresponding key is pressed. MEM stores 00000 when none of the keys are pressed. MEM stores the value 11111 when all five keys are pressed simultaneously.

The WAIT instruction uses the binary AND operation to select the bits of interest in MEM. If we want to wait until either SHIFT keys or the CONTROL key (or both) are pressed, we would use the statement WAIT MEM,5. The second argument in the WAIT command is a bit mask. The bits in the binary representation of the mask which are 1's identify which bits in MEM are to be tested. With a mask of decimal 5, only the 1 and 4 bits of MEM are tested. Bits 2, 3, and 5 are ignored. This means that only the SHIFT and CONTROL keys are relevant.

WAIT MEM,A loops until the value in MEM masked with A gives a non-zero result. To make things even more complicated, the third WAIT argument specifies whether the selected bits should be inverted before they are tested. To make the program loop until either the SHIFT key is released or the CONTROL key is pressed, use the command WAIT MEM,5,1. The 1 means to invert the state of the SHIFT key's bit before testing it. In other words, wait until the SHIFT key is released.

Change line 10 of the previous program to this:

```
10 FOR N=1 TO 500 : NEXT : WAIT MEM,5,1
```

Enter RUN then quickly press one of the SHIFT keys. The program now pauses in line 10 until you either release the SHIFT key, or you simultaneously press the CONTROL key. (The FOR-NEXT loop gives you a moment to get your finger on the SHIFT key after entering RUN.)

To wait for other key combinations in your programs, you can use the decimal values for the keys listed above. You might find it easier to visualize what is happening by thinking in terms of the binary values we have discussed.

MAXIMUM OBSCURITY

The last command on my list this time around is PUDEF. It is available only on the Commodore 128, but Commodore 64 users aren't missing much. I will let you look up the syntax and usage of PUDEF so as not to bore you here. PUDEF lets you redefine certain default values for the PRINT USING command. It is probably useful for European programmers of the Commodore 128 who want to replace the dollar sign with the English pound, or to use a comma instead of a period as the radix point.

A discussion of PUDEF and PRINT USING is another month's topic. PRINT USING is a very powerful and useful command. PUDEF on the other hand is of marginal use, and therefore deserves to be at the bottom of the list of obscure commands.

I have ignored the special purpose sprite and graphics commands, some of which could surely be called obscure. If you know of other commands which you feel are more obscure than those I have listed, don't tell me about them. We will just leave them that way. ☐

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Something nasty has happened at the futuristic Pleasure Complex on Zeugma IV dubbed Centrepoint, and it's got the entire planet of Calibos up in arms. Centrepoint, along with its 12th Generation mega-computer system and complement of Cycloid Patrol Craft, has been taken over by a mysterious, and clearly sinister, invasion force.

An exploration team, led by the son of the legendary Calibos fighter pilot Chandos, entered Centrepoint. The team was wiped out by the reprogrammed Cycloids, which now patrol the vast network of trackways encircling the Pleasure Complex.

Now Chandos is looking for some payback. To that end he assembled a motley crew of star pilots and space Assault Corps (aka Trackers).

The Trackers and their Skimmer craft—ideal for cruising the corridors of Centrepoint and armed with dual pulse-lasers—are loaded onto a Mothership and transported to Zeugma IV. There, the Mothership attains geostationary orbit and the Trackers and Skimmers teleport down to face the renegade Cycloids.


The many modules of Dragon's Lair *are stifled by poor game mechanics.* *READER SERVICE NO. 193*

The Trackers must navigate the Centrepoint trackways (22 interconnected sectors split into three rings: Central, Inner and Outer). At the Central Ring, they must nuke the main computer (ionize it, actually, courtesy a pair of ion bombs on board the Skimmer). These trackways present several difficulties, primary being the fact that they're crawling with Cycloids. Further, they're too narrow to permit the Skimmers (or Cycloids) to turn around, so all turns must be navigated in the "nodes," the modules which link the interconnecting tracks.

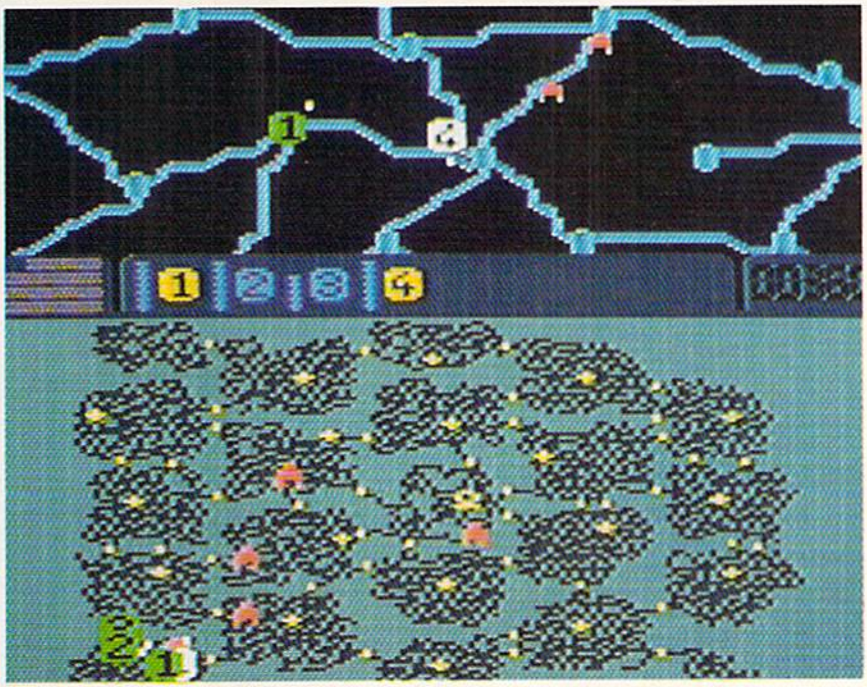
The Trackers must challenge the patrolling Cycloids and destroy the Communications Centre and Communication Links found in each sector. This is done through a combination of strategy and tactics. The user controls only one Skimmer at a time, so it is advisable for the player to get a Skimmer going in the right direction and then move on to another, and so on. The player will also want to assume direct control of a Skimmer in the event of combat with a Cycloid.

The primary display in *Tracker* is the Long Range Scanner. This provides an overview of Centrepoint with four magnification levels (x1, x2, x4, x8). For combat, however, a secondary display appears, offering a quasi-first person perspective (as seen in *Pole Position*, for example, where the vehicle appears in the immediate foreground). The LRS display is a long way from state-of-the-art, but provides adequate visual cues, while the Direct Combat Mode features satisfying graphics.

Tracker is a solid strategy game that is greatly enhanced by the addition of first-person combat to the mix.

Firebird, P.O. Box 49, Ramsey, NJ 07446 (phone: 201-444-5700).

—Bill Kunkel


Tracker *displays Centrepoint at four levels.* *READER SERVICE NO. 194*

DRAGON'S LAIR
Electronic Arts
Commodore 64
Disk; $24.95

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would be my prime candidate for enshrinement among the gilded gobblers, next to such colossal flops as Atari's, *E.T.* and First Star's *Superman*.

Dragon's Lair was co-produced by an ex-Disney film animator and a coin-op company known mostly for its series of classic vector graphics arcade games (*Star Hawk, Star Castle*, etc.). Don Bluth, whose studio produced the popular feature-length animated film, "The Secret of N.I.M.H.," joined forces with the financially troubled Cinematronics to provide the coin-op craze with its last hurrah when they turned *Dragon's Lair* loose on arcades in 1983. Though not much of a game, *Dragon's Lair* integrated the then-new laserdisc technology with beautiful animation sequences produced by Bluth and his studio of Disney renegades. Together they fashioned a state-of-the-art visual masterpiece. Laserdisc coin-ops briefly revitalized arcades' flagging fad before the heavy cost of the hardware and R&D caused the laserdisc technology to be abandoned entirely. This left arcades with mostly copycat games played on convertible coin-ops.

Several software developers discussed plans to bring *Dragon's Lair* to home computers, but the project languished for almost five years.

Now from Software Projects Ltd. and Electronic Arts comes *Dragon's Lair*, a collection of weak action games incorporating characters, scenes, and props (Dirk the Daring, the Dragon, the pits, ropes, etc.) from the original entertainment. The big problem with the coin-op was the time lapse between the player's input and the movement of the stylus to the appropriate groove on the laserdisc. No such problem should exist in a computer game—but despite this, darned if the designers didn't permeate the entire program with stiff action, restricted play options, and game challenges that rely almost exclusively on simple timing.

The game begins when the user joystick-leaps Dirk the Daring from a ramp onto a platform which is the elevator that transports Dirk to the different game areas. During the descent, however, anthropomorphic clouds pop up at any of four positions around the perimeter of the platform and emit gusts of wind. The user must move Dirk *toward* the gusts to keep from being blown off the platform and into a pit of fire. This sequence constitutes one of the most boring game mechanics imaginable.

Stay on the platform, and the first stop is Skull Hallway. The game instruction provided for this minigame reads as follows: "Pulverize the skulls with a perfectly timed swing of Dirk's deadly sword." Not quite. Actually, Dirk must first jump backwards, away from the chattering skulls. The swing must be timed to take out mist monsters, who aren't even mentioned in the documentation. These appear from alcoves on the left and right. Such examples of shoddy play instructions and weak design riddle the game.

The reactive gaming continues for as long as the player can take it: Dirk swings on burning ropes, dodges magic weaponry, jumps from ramp to ramp while skewering Goons, battles the Lizard King, on and on, through two disk sides and 17 minigames.

The problem is the low quality and imagination-level of the games. The coin-op had beautiful graphics and clumsy gameplay. A home version would not be expected to duplicate the visual splendor of the arcade game, but it should certainly improve on these stifling game mechanics.

Dragon's Lair is a tremendous disappointment and proof positive that seventeen mediocre games are no substitute for one good one.

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404 (phone: 415-571-7171). *—Bill Kunkel*

DARK LORD
Electronic Arts/Datasoft
Commodore 64
Disk; $19.95

To be honest, I rarely enjoy combination graphics-text games on the C-64. The memory capacity of our beloved brown micro just doesn't seem sufficient to hold both a thorough, engrossing plot and credible graphics screens to illustrate the action. It seems certain that no matter how clever the programmer, he'll never be able to squeeze the rich text found in Infocom games together with beautiful graphics screens one might encounter in *Defender of the Crown*. One or the other invariably suffers in the translation. But there is at least one exception.

Dark Lord has to be experienced to be believed. It is resplendent with beautiful music accompanying almost every screen, and gentle animation throughout enhancing the player's sense of location.

The text parser is highly intelligent, recognizing both compass directions and player's orientation (i.e. "left," "forward") for movement. The vocabulary is not colossal, but the key words to solving important puzzles exist in enough forms to insure that you won't waste too much time trying to give the specific order you need.

I found *Dark Lord* to possess another rare detail: the correct balance of difficulty as the game progresses. Each puzzle requires sweat and thought, but not so much that the gamester will decide to chuck the whole thing and break out his copy of *Pac-Man* to unwind. Each new barrier seems on the tip of the tongue, and when finally solved does not leave the player feeling like an idiot because he didn't leap upon the solution instantly.

Last, but certainly not least, I found *Dark Lord* scary. As incredibly jaded as I am by the several thousand hi-res screens that have passed through my computer, I was amazed when I found myself getting the jitters! When the sun goes down and it gets cold outside, you'll find yourself wishing you had a warm place to sleep for the night. If you're still stoic, then wait for the far-off echoing screams to start. Not soon after you might even be visited by the villain himself, his presence sending a cold chill up your spine.

This game is obviously a work of love by its creators. The atmosphere and character that only comes with hundreds of hours of refinement shines forth *Zork*-like in *Dark Lord*, and I found myself getting a bit nostalgic for the days when a man might pull a carpet aside to reveal a trapdoor in an old white farmhouse.

I expected that I would have to deep-fry this release as just another graphics slideshow, but instead I must conclude with the highest recommendation of this original game. If you have $20 to spare, please go out and buy *Dark Lord* and once again lose yourself in that twilight zone of imagination you thought had been eclipsed in today's software market.

Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404 (phone: 415-571-7171). *—Cleveland M. Blakemore*

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Math Master (5/84)
Micro Minder (8/84)
Multi Draw 64 (1/84)
Name That Star (4/84)
Post Time (6/84)
Salvage Diver (9/84)
Space Lanes (VIC) (3/84)
Space Lanes (64) (3/84)
Space Patrol (12/84)
VIC 40 (10/84)

BEST OF '85

Ahoy! Dock (9/85)
Auto Line Numbers (3/85)
Directory Manipulator (12/85)
File Lock (9/85)
Fontasia (2/85)
Futurewar! (2/85)
Gameloader (12/85)
Home Budget (3/85)
Jewel Quest (12/85)
Lightning Loader (11/85)
Midprint (1/85)
Music Tutor (1/85)
Salmon Run (3/85)
Screen Dump (8/85)
Telelink (2/85)
Tile Time (5/85)

BEST OF '86

Disk Cataloger (8/86)
Dogcatcher (9/86)
Fidgits' Music School (7/86)
Flap! (8/86)
Guardian (11/86)
Head to Head (2/86)
Highlight (8/86)
JCALC (4/86)
Meteor Run (8/86)
Mine Canyon (9/86)
Mountaineer Mack (10/86)
Star Strike (6/86)
Step On It (8/86)
Syntax Patrol (9/86)
Teleporter (11/86)
Tenpins (11/86)
1541 Alignment Check (2/86)

BEST UTILITIES

Auto Append (7/85)
BASIC Trace (4/85)
Base Conversions (9/84)
Booter (4/85)
Commodore Font Editor (5/85)
DOS (9/84)
Fastnew (9/85)
Formatter (8/85)
Lucky Lottery (7/85)
Maestro (10/85)
Micro Minder (8/84)
Printat (7/85)
Screen Bit Dump (6/85)
Screen Magic (6/85)
Start & End File Address (9/85)
Two Column Directory (5/85)
Windows (8/85)
1541 Cleaning Utility (10/85)

BEST UTILITIES II

Alarm Clock (1/86)
BASIC Relocator (1/86)
Bigprint (5/86)
Chrono-Wedge (4/86)
Disk Checkup (10/86)
Failsafe (5/86)
Long Lines (11/86)
Programmer's Aid (3/86)
Quick Change (10/86)
Reversed Remarks (7/86)
Screen Sleuth (7/86)
Screen Window (4/86)
Speech64 (9/86)
The Editor (12/86)
Trackdown (6/86)
Very-Able (3/86)
128 to 64 Autoboot (10/86)

BEST GAMES

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Construction Co. (12/84)
Disintegrator (8/85)
Dragon Type (9/85)
Duck Shoot (6/85)
Emerald Elephant (10/84)
Gators N Snakes (8/85)
Gravinauts (10/85)
Lawn Job (10/84)
Mystery at Mycroft Mews (10/85)
Name That Star (4/84)
Post Time (6/84)
Salvage Diver (9/84)
Script Analysis (7/85)
Space Patrol (12/84)
Tile Time (5/85)
Wizard of Im (7/85)

BEST GAMES II

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128 to 64 Autoboot (10/86)

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For the C-64

"Dr. Brooks! Please listen to me! Be sensible, man!" you yelled as your colleague pointed the stun weapon at you. He scooped up a hyperdimensional radio receiver from the table as he backed away.

He was sweating feverishly, a half-lunatic look of desperation in his eyes. You knew his recent failures as an Amway salesman had unsettled his mind, but you'd never guessed he'd go this far.

Brooks waved the gun at you and uttered a mad, cackling laugh. "I have nothing to lose! I've got 4000 six-gallon bottles of Crisco oil and no place left to sell them! Hahahahaha!"

Dr. Brooks stepped inside the antimatter flux portal and threw a switch. "I'm not exploiting my marketing potential! There must be millions of customers the past two thousand years who need Crisco oil like life itself!"

You threw yourself forward in a desperate attempt to stop him, but he fired the stun weapon. Everything vanished in a flare of light as you slipped into unconsciousness.

When you awoke, your head throbbing, you were surrounded by three of the weirdest looking aliens you'd ever seen—and you'd seen plenty. Ever since you and Dr. Brooks discovered the *Time Subway*, a network of interdimensional tunnels in time created by an alien civilization over a million years before, you'd become used to bizarre travelers dropping in and out of the laboratory.

These three characters were impressive nonetheless. A walking alligator stood flanked by a sinister hooded figure on one side and some kind of cyborg on the other. They were all armed with exotic weaponry that you were unable to identify.

"We are looking for Dr. Brooks, your colleague," the scaly one hissed.

"We're Subway Patrolmen," barked the creature with the burnoose, his eyes shining yellow from inside his hood.

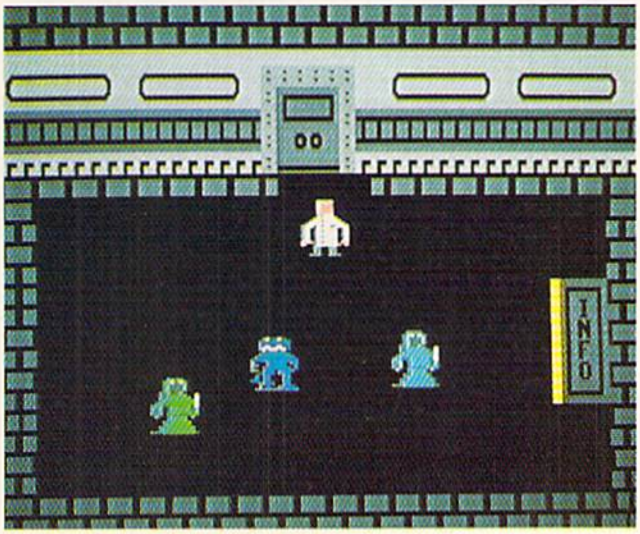
"Our job is to prevent primitive underdeveloped races like your own, HU-man, from distorting the flow of time and changing history," said the cyborg, his voice an electric hum. "This Dr. Brooks has already committed several non-interference violations!"

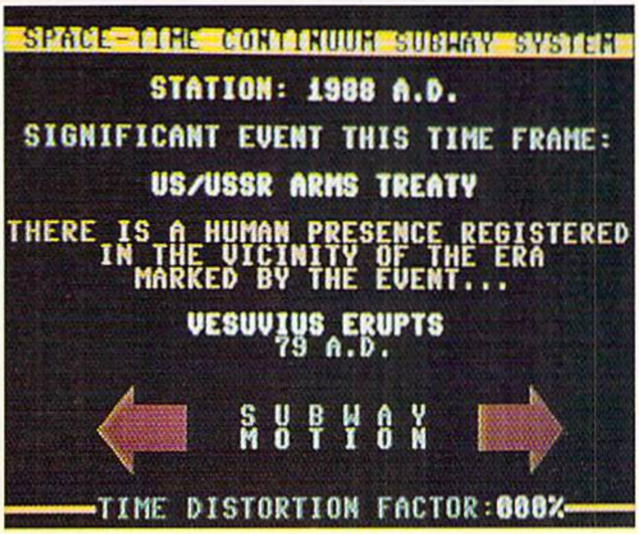
You scrambled to your feet in protest. "Wait! Let me find him. I know I can bring him back!"

They glanced at one another uneasily, hissing and growling under their breath.

Time Subway is a highly educational game that I would recommend for the purpose of teaching younger (or older) children history and the chronological relationships of important events and discoveries.

The object of *Time Subway* is to stop Dr. Brooks from completely upsetting world history as we know it. If he achieves 100% time distortion while selling six-gallon Crisco to earlier generations (thus giving them crisp and tasty fried foods that are low in cholesterol long before they are responsible enough to handle it), Earth's history will be so affected that you and he will *never* discover the *Time Sub-*





PHOTOS: MICHAEL R. DAVILA

way in the first place, and a time paradox will occur that will throw the flow of time into a closed loop.

The game uses Port 2 for joystick control.

Brooks is hiding somewhere between 0 A.D. and 1988 A.D., and it's up to you to locate his station and nab him.

Each year has its own subway station, and each station has its own information booth, provided courtesy of the long dead alien race that built the subway.

The problem with the subway stations is that they are swarming with subway patrolmen, aware of Brooks' hijinks and struggling to locate him and put him on ice!

They have no orders to assassinate you, but they are a terrible nuisance in that if they catch you, they will throw you on the very next train out and shuttle you off to some random moment in history, throwing you off the trail. Because Dr. Brooks is carrying a hyperdimensional radio, he will know if you are caught and move to a new location in time whenever the subway patrolmen report your interference to their chief.

To use the information booth, walk into it and press the fire button. The booth can tell you your exact location in time, as well as Dr. Brook's position. It will also report to you any significant occurrence in your current era, so you can get your bearings in terms of Earth's history.

Most important of all, the info booths contain the control levers for the subway itself, so that you can reverse the direction of the train's forward or recessive motion in time. Using the joystick, you light up the arrow on the left to go BACK in time, and the arrow on the right to go FORWARD. Push the button to exit the control booth and return to the subway platform.

To get on the train, walk forward to the platform exit and press the fire button. You are now safe from patrolmen (they can tell that you're leaving anyway) as the train slows to a stop and you board.

The screen that follows will show your train rushing down a corridor in time, with the year in reverse white. Press the button when you want the train to stop at a station.

When you encounter Dr. Brooks, he'll be firing his stun gun like crazy. If he hits you with one of the shots, you'll wake up on a train again, with Brooks fleeing to another time era. Grab him without getting hit to win the game.

It may sound simple, but once you play for a while you'll see that it's difficult indeed to avoid the subway patrolmen and commute to the correct year before Dr. Brooks messes up history beyond hope.

I was not able to incorporate my plans for expanding the game into the program. Because I lowered the top of BASIC to make room for the sprites, the program runs safely with only 200 bytes free in memory. This makes it impossible to add new historical dates as I had previously planned. Nonetheless, I know you'll find the 40+ eras within the program suitable for a long time.

I wish to thank my friend Lynwood Brooks for the original concept of this program, and wish him good luck in his new business career. This is the first time I've created a program based on cooperative brainstorming. ☐

SEE PROGRAM LISTING ON PAGE 70

COMMODARES
PROGRAMMING CHALLENGES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

Commodares, c/o *Ahoy!*
P.O. Box 723
Bethel, CT 06801

We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Put *your* name and address on the listings as well. Show sample runs if possible. Briefly describe your solutions and tell what makes them unique or interesting, if they are. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #52-1: LATER DATE

This problem was submitted by Wallace Leeker (Lemay, MO). Add a subroutine to this program which determines whether the date in A$ is earlier than, later than, or the same as the date in B$. The dates are stored in MM/DD/YY format and are assumed to be in the 20th century.

```
10 FOR N=1 TO 3: READ A$,B$
20 GOSUB 50: NEXT N: END
30 DATA 03/08/88, 09/16/74, 01/02/03,
01/02/04
40 DATA 08/10/80, 08/10/80
50 ... your subroutine starts here ...
```

The first output should be "03/08/88 is later than 09/16/74".

PROBLEM #52-2: TIME CLOCK

Try this one from Jim Speers (Niles, MI). Your company just bought a new time clock which records working time in minutes. The payroll department has calculated wages based upon quarter-hours for years and is not about to change their ways. It is up to you to write a program which converts any number of minutes to hours and quarter hours (rounded to the nearest quarter hour). Keep payroll happy and keep your job.

PROBLEM #52-3: CLOCK SEGMENTS

Beat the clock on this problem from Bob Renaud (Washington, MA). Given a 24-hour, 6-digit, 7-segment digital clock, write a program which displays in HH:MM:SS format all the times during the day when exactly half (21) of the 42 digit segments are turned on. Your program must also print the number of times each hour and the total number of times within a day which meet this criterion. Times run from 00:00:00 to 23:59:59.

Assuming no tails on the "6" and the "9", the numbers of segments for numerals "0" through "9" are 6, 2, 5, 5, 4, 5, 5, 3, 7, and 5. Notice that all seven digits are lit for the numeral "8". Obviously there will be quite a lot of "grinding" in this program. Bob's challenge to you is to beat his C-64 time of 247 seconds (no machine language). You may print all times in the upper left corner of the screen to save time.

PROBLEM #52-4: FACTOR FUN

Have fun with this one from Dale Ickes (Uhrichsville, OH). The user specifies a positive integer. The computer displays all the factors of that integer. Any tricks to speed this up for large numbers are welcome.

This month we will look at the best solutions to *Commodares* from the December 1987 issue of *Ahoy!* Before we get started, here is a quick solution to a problem discussed last month. *Problem #47-3: Joyful Sprites* or *Spirits* as you prefer). Gerald Gilley (Killeen, TX) sent this one-liner for the C-128.

```
·1 REM ===================================
·2 REM    COMMODARES PROBLEM #47-3 :
·3 REM     JOYFUL SPIRITS
·4 REM    SOLUTION BY
·5 REM     GERALD GILLEY
·6 REM ===================================
·10 FORX=1TO64:POKEX+3583,0:NEXT:POKE3593
 ,170:POKE3596,170:POKE3594,85:POKE3595,8
 5:SPRITE1,1,1,0,0,0,1:PRINT"[CLEAR]":DO:
 T=JOY(2):I=(T-1)*45:MOVSPR1,I#(6*-(T>0))
 :LOOP
```

Plug your joystick into Port 2. The program creates a small "light saber" which moves on the screen under joystick control. If you don't see the sprite initially, just hold down the joystick button. It will eventually come gliding into view.

Justin Smalley (Boulder, CO) was kind enough to point out an error in the first solution to *Problem #44-1: Added Difficulty* in the December 1987 issue of *Ahoy!* Line 20 of Timothy Slate's solution should have been GOSUB 40 in two places instead of GOSUB 50. This was my editing error. The program works as advertised if you make those two

changes.

Everyone was counting change with *Problem #48-1: Coin Challenge* submitted by Wally Sito (Iselin, NJ). The basic problem was to determine the value of coins specified by the user and tell whether it is greater than, less than, or equal to one dollar. An advanced option was to determine the numbers of coins to be added or subtracted in order to bring the amount to exactly one dollar.

This solution from Don Donati (Vandergrift, PA) solves both challenges.

```
•1 REM ====================================
•2 REM     COMMODARES PROBLEM #48-1 :
•3 REM      COIN CHALLENGE
•4 REM     SOLUTION BY
•5 REM      DON DONATI
•6 REM ====================================
•100 C$(1)="PENNIES":V%(1)=1:C$(2)="NICKE
 LS":V%(2)=5:C$(3)="DIMES":V%(3)=10
•110 C$(4)="QUARTERS":V%(4)=25:C$(5)="HAL
 F-DOLLARS":V%(5)=50:TT%=0:PRINT"[CLEAR]"
•120 FOR I=1 TO 5
•130 PRINT C$(I);:INPUT N%:IF N%<0 THEN 1
 30
•140 TT%=TT%+N%*V%(I):NEXT I
•150 PRINT:PRINT"TOTAL: $";TT%/100
•160 ON SGN(TT%-100)+2 GOTO 170, 180, 190
•170 PRINT"LESS THAN A DOLLAR":PRINT "ADD
 :":GOTO 200
•180 PRINT"EQUAL TO A DOLLAR": END
•190 PRINT"GREATER THAN A DOLLAR":PRINT"R
 EMOVE:"
•200 DF%=ABS(TT%-100)
•210 FOR I=5 TO 1 STEP -1
•220 C%=DF%/V%(I):IF C%=0 THEN 240
•230 DF%=DF%-C%*V%(I): PRINT C%;C$(I)
•240 NEXT I : END
```

Don uses the C$ array to store the names of the coins and the V% array to store their values in cents as defined in lines 100 and 110. The FOR-NEXT loop starting at line 120 prints each coin's name and requests the quantity of each coin.

The total value of money is stored in the integer variable TT%. Don mentioned that he used integer variables to prevent round-off errors from creeping in. Don's use of coin values stored as cents rather than hundredths of a dollar also solves the round-off and internal storage problem (there are no .499999 results).

Don made good use of the ON-GOTO and SGN statements in line 160. The SGN ("signum") function gives a value −1, 0, or +1 depending upon whether (TT%-100) is negative, zero, or, positive. Adding two to that answer gives a result of 1, 2, or 3. The ON-GOTO statement uses that result to jump to either the first, second, or third line number listed at the end of line 160. You will see the appropriate messages in lines 170, 180, and 190.

The optional challenge is implemented beginning at line 200. DF% stores the absolute value of the difference between the total and one dollar. The FOR-NEXT loop starting at line 210 steps through the coins, largest value first, deciding the maximum number of each type of coin which could be contained within DF%.

Remember that this is integer division and the result will be the quotient of the two numbers rounded down to the nearest integer. Line 230 reduces DF% by the value of that many coins and updates the screen. The IF statement in line 220 skips any coin whose value is greater than the current value of DF%. Nicely written and easy to understand, Don.

Critters of every description were wandering around the screen in response to *Problem #48-2: Random Walk* suggested by Justin Smalley (Boulder, CO). The idea is to put an object on the screen which goes one step at a time in a randomly chosen direction—up, down, left, or right.

This solution from Judy Groth (Brooklyn, NY) works on either the C-64 or the C-128 (40 column mode).

```
•1 REM ====================================
•2 REM     COMMODARES PROBLEM #48-2 :
•3 REM       RANDOM WALK
•4 REM     SOLUTION BY
•5 REM       JUDY GROTH
•6 REM ====================================
•10 POKE 53280,0:POKE 53281,0:PRINT"[CLEA
 R][c 7]";:SP=1024:SC=54272
•20 CC(1)=2:M(1)=-40:CC(2)=6:M(2)=40:CC(3
 )=7:M(3)=-1:CC(4)=5:M(4)=1
•30 A=INT(RND(1)*4)+1: UC=112+A: IF A=4 T
 HEN UC=107
•40 S=SP+M(A):IFS<1024 OR S>2023 THEN 30
•50 POKE SP,UC:POKESP+SC,CC(A):SP=SP+M(A)
 :REM IF PEEK(S)=32 THEN SP=SP+M(A)
•60 POKE SP,81:POKE SP+SC,1:GOTO 30
```

Line 10 clears the screen and sets the color to light blue. SC is the starting address of screen color memory, and SP is the starting address of screen character memory.

The random direction is stored in A. The graphics character UC and its color CC( ) are then selected. Line 40 adds M(A) which is −1 (left), 1 (right), −40 (up), or 40 (down) to the screen position. The IF-THEN statement in line 40 verifies that the new position is still on the screen (screen memory goes from 1024 to 2023). If not, a new random direction is chosen. Line 50 puts the character in the screen location just visited, sets its color, and updates the screen pointer. Line 60 puts a white circle cursor at the new location.

You may replace the SP=SP+M(A) in line 50 with the statement in the REMark. This allows the cursor to move only into screen locations which have not been visited yet. Judy says that it may take 5 moves or 1040 moves, but the cursor will eventually trap itself. Press RUN STOP to stop the program.

Here is an interesting version of the program submitted by Paul Sobolik (Pittsburgh, PA).

```
•1 REM ================================
•2 REM     COMMODARES PROBLEM #48-2
```

```
•3 REM       RANDOM WALK
•4 REM    SOLUTION BY
•5 REM       PAUL SOBOLIK
•6 REM ====== C-64 ONLY  ==============
•10 C0=49152
•20 FOR X=0 TO 4*8
•30 :    READ A
•40 :    POKE C0+X,A
•50 NEXT
•60 FOR X=0 TO 8:POKE C0+32*8+X,0:NEXT
•70 V1=PEEK(56576):V2=PEEK(53272):OS=PEEK
 (648)
•80 POKE 53272,16:POKE 56576,V1 AND 252:P
 OKE 648,(C0+1024)/256
•90 PRINT"[CLEAR][20"[RIGHT]"][12"[DOWN]"
 ]";
•100 DATA 24,60,126,255,24,24,24,24: REM
 UP ARROW
•110 DATA 24,24,24,24,255,126,60,24: REM
 DOWN ARROW
•120 DATA 16,48,112,255,255,112,48,16: RE
 M LEFT ARROW
•130 DATA 8,12,14,255,255,14,12,8,0: REM
 RIGHT ARROW
•140 XP = 211:YP = 214
•150 DIM A$(4)
•160 A$(0)="@[LEFT][UP]": REM UP
•170 A$(1)="A[LEFT][DOWN]": REM DOWN
•180 A$(2)="C[LEFT][LEFT]": REM LEFT
•190 A$(3)="B"  : REM RIGHT
•200 X=INT(RND(1)*4)
•210 CX=PEEK(XP)
•220 CY=PEEK(YP)
•230 IF X=0 AND CY=0 THEN  280
•240 IF X=1 AND CY=24 THEN 280
•250 IF X=2 AND (CX=0 OR CX=40) THEN 280
•260 IF X=3 AND (CX=39 OR CX=79) THEN 280
•270 PRINTA$(X);
•280 GETA$:IFA$=""THEN200
•290 POKE 648,OS:POKE53272,V2:POKE 56576,
 V1
```

This program runs only on the C-64. Paul defines some new characters listed in lines 100 through 130. Line 10 through 50 put them into memory. Lines 70 and 80 point the VIC chip to the proper memory locations to find these characters. XP and YP keep track of the cursor's current position. Lines 200 through 280 are the heart of the program. Here the new direction is chosen. The screen boundaries are checked, and the next character is displayed.

Press any key (except RUN STOP) to stop this program. It restores screen and character memory pointers in line 290 before returning. Paul's choice of characters makes this a very interesting screen display. You could define your own characters by changing the numbers in the DATA statements. The *C-64 Programmer's Reference Manual* describes the procedure for programmable character sets (starting on page 108).

Now let's look at *Problem #48-3: Time Machine*. The user enters a time (hours and minutes) and a number of minutes. The computer displays the time which is that many

minutes before and after the given time. John Thelen (Caledonia, WI) sent this short solution.

```
•1 REM ===================================
•2 REM    COMMODARES PROBLEM #48-3 :
•3 REM      TIME MACHINE
•4 REM    SOLUTION BY
•5 REM      JOHN THELEN
•6 REM ===================================
•10 INPUT"HRS.,MIN.,AMT.";H,M,A:GOSUB 30
•20 A=0-A: GOSUB 30: END
•30 B=H*60+M+A: C=B/60
•40 IF INT(C)<1 THEN C=12+C: GOTO 40
•50 IF INT(C)>12 THEN C=C-12: GOTO 50
•60 B=C-INT(C): D=B/1.67: PRINT INT(C)":"
 INT(100*D+.5): RETURN
```

The subroutine at line 30 converts the time to minutes and adds the quantity of minutes. Lines 40 and 50 take care of the problem of the resulting hour being less than one or greater than 12. The division by 1.67 in line 60 converts hundredths of an hour to minutes. The number of minutes D is then rounded to the nearest whole number within the PRINT statement. This process is repeated with the negative of the specified number of minutes in line 20.

Jerry Nichols (Berryville, AR) used the following lines to input the specified time:

```
1 PRINTTAB(14)CHR$(34)CHR$(13)CHR$(145);
2 POKE631,29: POKE 198,1: INPUT"CURRENT
TIME";T$
```

Line 1 puts the computer into "quote" mode. The POKE statements put a CRSR RIGHT into the C-64 keyboard buffer. Now the user can enter "6:30" as a single quantity without getting the "Extra Ignored" error that the colon would normally produce. When the INPUT statement is executed, the CRSR RIGHT in the keyboard buffer moves the cursor to the right of the quotation mark, ready for the user's input.

Jim Speers (Niles, MI) couldn't decide whether to use 12-hour time or 24-hour time. His solution for the C-128 below lets the user decide.

```
•1 REM ===================================
•2 REM    COMMODARES PROBLEM #48-3 :
•3 REM      TIME MACHINE
•4 REM    SOLUTION BY
•5 REM      JIM SPEERS
•6 REM ===================================
•100 PRINT"[CLEAR][DOWN][RVSON]12[RVSOFF]
  OR [RVSON]24[RVSOFF] HOUR TIME?": INPUT
  TM: IF TM<>12 AND TM<>24 THEN 100
•110 B=1: E=12: F=720: IF TM=24 THEN B=0:
  E=23: F=1440
•120 PRINT"[CLEAR][DOWN][RVSON]PRESENT TI
 ME:[RVSOFF]": PUDEF"0,.$"
•130 PRINT"HOUR";: INPUT H: IF H<B OR H>E
  THEN 130
•140 PRINT"MINUTE";: INPUT M: IF M<0 OR M
 >59 THEN 140
•150 TM=H*60+M: PRINT"[DOWN]TIME DIFFEREN
 CE(MIN)";: INPUT D: T1=TM-D: T2=TM+D
•160 IF T1<0 THEN T1=T1+F: GOTO 160
•170 IF T2>F THEN T2=T2-F: GOTO 170
•180 X=T1: GOSUB 200: PRINT USING"##:##";
 HR,MN
•190 X=T2: GOSUB 200: PRINT USING"[DOWN]#
 #:##";HR,MN: END
•200 HR=INT(X/60): MN=X-60*HR: IF HR=0 AN
 D DE=12 THEN HR=12
•205 IF HR=24 AND E=23 THEN HR=0
•210 RETURN
```

Jim uses the rather obscure PUDEF statement to make the PRINT USING "space filler" character become a "0". Lines 160 and 170 adjust for a differential larger than one day. Jim said that you could add the logic to handle different days, if desired.

Evidently *Problem #48-4: More Income* was really "more confusion" for most readers. You were to write a computer simulation of this classic problem. You are offered a job with an annual salary of $15,000. You must choose between Plan A in which you get a $750 raise every six months, or Plan B in which you get a $3000 raise every year.

Wallace Leeker (Lemay, MO) interpreted the problem the way it was intended in his program listed below.

```
•1 REM ===================================
•2 REM    COMMODARES PROBLEM #48-4 :
•3 REM      MORE INCOME
•4 REM    SOLUTION BY
•5 REM      WALLACE LEEKER
•6 REM ===================================
•10 PRINT"[CLEAR] YR[4" "]TOTAL[3" "]SALA
 RY[4" "]TOTAL[3" "]SALARY":PRINT
•20 BP=15000:T2=7500:T1=15000
•30 DO UNTIL A=10:A=A+1:B=0
•40 :  DO UNTIL B=2:B=B+1:Y=Y+.5
•50 :      PRINTY;TAB(6)T2;:R2=R2+750:PRIN
 TTAB(15)BP/2+R2:T2=T2+BP/2+R2
•60 :    LOOP
•70 : PRINTTAB(24)"[UP]"T1;:R1=R1+3000:PR
 INTTAB(33)BP+R1:T1=T1+BP+R1
•80 LOOP
```

If you assume the $750 raise was added to the base pay for the next six months, Plan A provides a first-year income of $15750 ($7500 + ($7500 + 750)). Plan B clearly gives a first-year income of $15000. During the second year, Plan A has six-month payments of ($7500 + 2*$750) and ($7500 + 3*$750) for a yearly salary of $18750. Plan B has a second-year payment of ($15000 + $3000) or $18000.

The cumulative total from Plan A always exceeds that of Plan B, as Wallace's program shows. The ten-year cumulative for Plan A is $292,500, and it is $285,000 for Plan B.

C-64 users must replace the DO UNTIL and LOOP statements. Change these lines as follows:

Continued on page 81

AMIGA SECTION

Featured This Month:

SUPERSTAR INDOOR SPORTS
SportTime (Mindscape)
Amiga (512K)
Disk; $49.95

Ed Ringler's four-game package is hardly the typical computer entertainment product. Darts, Bowling, Air Hockey, and Superstar Ping Pong can't match the glamor of the Olympic track and field events which fill other action-sports anthologies like Epyx's *Summer Games*. In truth, the components of this multievent competition may sound positively boring to some Amiga owners.

Prepare to abandon all preconceptions. This is a delightful compilation of four excellent contests. Unlike some other sports titles, each activity in *Superstar Indoor Sports* is a fully realized, complete game with elaborate graphics and play-mechanics. Mindscape probably could have released Superstar Ping Pong as part of the Thunder Mountain line, on a disk by itself.

The Main Menu is the hub of this joystick-activated compendium for one to four computerists. The participants must enter their names (up to six characters) through the keyboard, but a joystick plugged into Port 1 handles all subsequent commands. A second stick, in the other port, allows head-to-head action between human players.

Large cartoon drawings on the Main Menu symbolize each contest. Moving the joystick left or right lights the background color of each picture. The user presses the action button when the corresponding picture is lit. After some disk activity, the option menu for the specific competition appears on the monitor screen.

The program automatically retains scores. It enters the totals for each participant, including computerized foes, without further data input from the computerist. The scores appear at the end of each round of play and can also be accessed through the Main Menu.

Although somewhat similar to *On-Court Tennis,* Superstar Ping Pong is a clever simulation which captures the essence of this recreation room standard.

The interlocking menus let the user choose the paddle colors, the number of games, the speed of play, and most importantly, the ability profile of each paddle-wielder. Adjusting a player's backhand or reaction time drastically alters the game. No action-sports program makes it easier to handicap participants of unequal ability.

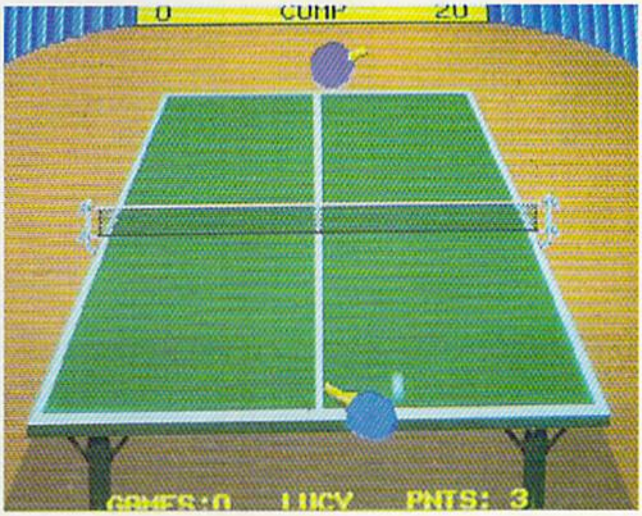
In Superstar Ping Pong, players select automatic or manual positioning of the onscreen players. The former alternative tries to put the paddle in the right spot to return a volley, while the latter makes the player maneuver the ping pong paddle with the joystick before pressing the action button to initiate a return shot. Employing automatic positioning without giving the paddle quick reaction time can prove very frustrating, indeed.

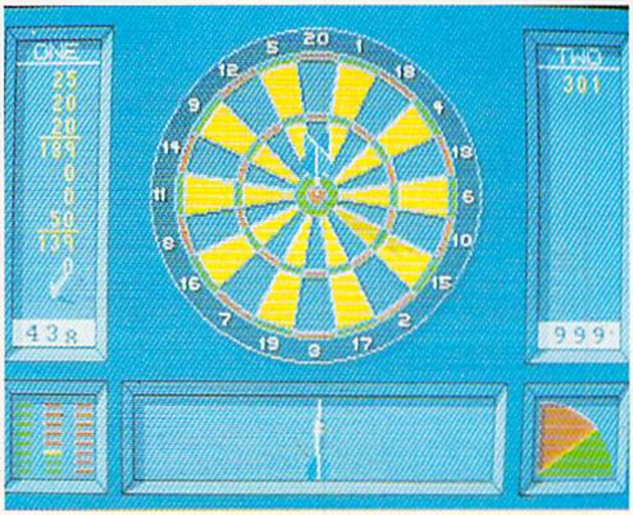
Air Hockey is the most exciting game in the package, especially at the higher speed settings. The goal mouth is quite wide, which puts a strong emphasis on offense.

The graphics for Air Hockey and Superstar Ping Pong share one unusual feature. Only the paddles are displayed. They move around the table as though propelled by unseen hands. It doesn't hurt gameplay, but it takes awhile to grow accustomed to the absence of onscreen people.

Darts and Bowling utilize a more traditional approach to visuals. A well-drawn human participant rolls the ball or throws a dart at the target.

Success in Bowling depends on mastering four elements. The user first sets up the electronic kegler starting point by moving the joystick forward and back. Holding down the button causes an arrow to move across the width of





Superstar Indoor Sports' *Ping Pong module makes it easy to handicap players of unequal ability.* **Darts** *requires the gamer to rapidly time three separate factors in order to hit the bullseye.* *READER SERVICE NO. 204*



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the alley from left to right. Releasing the button establishes the spot through which the bowler aims the shot.

The bowler, shown in pseudo-3-D side perspective, approaches the foul line. The gamer presses the action button just as the pin-basher fires the ball at the pins. The position of the stick governs how sharply the ball hooks.

Darts may seem like a sedate pastime for beery nights at the local pub, but Ringler makes it positively exciting. The gamer must time three factors in rapid succession to put the little missile in the bullseye.

The aiming screen shows a single dart which points to the large drawing of the target which occupies the upper two-thirds of the display. Moving the joystick moves the dart in the same direction. Pressing and holding the button stops the dart and fixes the aim.

This action starts the Angle Meter moving. Releasing the button chooses the angle of the throw.

Finally, the Power Meter in the lower left corner begins to cycle. The gamer sets the power and releases the dart by hitting the button one last time.

The Result Screen replaces the Aiming Screen. It shows a marksman aiming at the target in two-thirds perspective. The dart arcs to the target. A close-up indicates the exact location.

Despite its relatively steep retail price, *Superstar Indoor Sports* is a reasonably good value. These four modules guarantee hundreds of hours of entertainment for all Amiga gamers.

Mindscape, 3444 Dundee Rd., Northbrook, IL 60062 (phone: 312-480-7667). *–Arnie Katz*

PRINTER PORT BLUES

Using 1000-Compatible Peripherals with Newer Amiga Models

By Richard Herring

Downward compatibility is the theme song for many new computer products. Computer companies believe that users want that degree of stability. Old hardware add-ons should work with new computer systems and software templates should still load into the latest version of the software.

Sometimes computer companies cripple their new products in order to sing in the downward-compatible chorus. Other times, braver companies make the "right" change and hope the users won't find it too off key.

Those of us who have moved from the Amiga 1000 into the world of 500s and 2000s are faced with some of Commodore's decisions about when downward compatibility is important and when it isn't. This article discusses just one of the new Amiga's traits–the printer port–and how and why it has changed.

After plugging in a mouse and a monitor, the next most likely port on an Amiga to get the user's attention is the printer port. Yet Commodore chose to change that port on the new Amigas. It is a minor change really, but it's enough to cause complete incompatibility with Amiga 1000 peripherals and cables designed to use the printer port.

TABLE 1

AMIGA 1000 DB-25 MALE

PIN		LABEL	FUNCTION
	1	DRDY*	Data "ready" (strobe)
14		GND	Signal ground
	2	Data 0	Data bit 0
15		GND	Signal ground
	3	Data 1	Data bit 1
16		GND	Signal ground
	4	Data 2	Data bit 2
17		GND	Signal ground
	5	Data 3	Data bit 3
18		GND	Signal ground
	6	Data 4	Data bit 4
19		GND	Signal ground
	7	Data 5	Data bit 5
20		GND	Signal ground
	8	Data 6	Data bit 6
21		GND	Signal ground
	9	Data 7	Data bit 7
22		GND	Signal ground
	10	ACK*	Acknowledge
23		+5v	+5 volts
	11	BUSY(data)	Busy signal
24		NC	No connection
	12	POUT(clk)	Paper out
25		RESET*	Reset
	13	SEL	Select

The printer port is a simple 25-pin connector. On the 1000 it is male; on the 500 and 2000, female. A gender changer can fix that. But 24 of those pins carry a signal and Commodore chose to reposition 11 of them on its new computers.

The connections on the DB-25 connector used by the Amiga 1000 are shown in Table 1. (Each table shows the pins as they are positioned relative to each other when you look at the port.) The pins on the connector line up in two rows, pins 1-13 on top and 14-25 on bottom. The connector on the 1000 pairs the data lines (2-9) with the signal ground lines (14-22).

The 500 and 2000 parallel ports, on the other hand, push those signal grounds down three pins; from 14 to 17, 15 to 18, etc. The last three pins (23-25) from the Amiga 1000 are then moved up to pins 14, 15, and 16 on the 500 and 2000. Table 2 shows the change.

If you would like to have some idea how your computer and printer harmonize, the next few paragraphs give a general description. Let's assume you have a Amiga 500 and a typical dot matrix printer.

Pins 2 through 9 carry the 8 bits that compose an ASCII byte. This gives us parallel (8-bit wide) rather than serial (1 bit at a time) communication. These lines are set high when data is a logical "1" and low when it's a logical "0".

The computer must put all eight signals on these

TABLE 2

AMIGA 500/2000 DB-25 FEMALE

PIN	LABEL	FUNCTION
1	STROBE*	Data strobe
14	+5v Pullup	+5v power (100mA)
2	Data 0	Data bit 0
15	NC	No Connection
3	Data 1	Data bit 1
16	RESET	Reset
4	Data 2	Data bit 2
17	GND	Signal ground
5	Data 3	Data bit 3
18	GND	Signal ground
6	Data 4	Data bit 4
19	GND	Signal ground
7	Data 5	Data bit 5
20	GND	Signal ground
8	Data 6	Data bit 6
21	GND	Signal ground
9	Data 7	Data bit 7
22	GND	Signal ground
10	ACK*	Acknowledge
23	GND	Signal ground
11	BUSY	Busy signal
24	GND	Signal ground
12	POUT	Paper out
25	GND	Signal ground
13	SEL	Select

TABLE 3

IBM-COMPATIBLE DB-25 FEMALE / Centronics 36-pin typical printer

PIN	FUNCTION	PIN
1	Strobe	1
14	Auto feed	14
2	Data bit 0	2
15	Error	15
3	Data bit 1	3
16	Initialize	31
4	Data bit 2	4
17	Select in	36
5	Data bit 3	5
18	Signal ground	19-30 and 33
6	Data bit 4	6
19	Signal ground	19-30 and 33
7	Data bit 5	7
20	Signal ground	19-30 and 33
8	Data bit 6	8
21	Signal ground	19-30 and 33
9	Data bit 7	9
22	Signal ground	19-30 and 33
10	Acknowledge	10
23	Signal ground	19-30 and 33
11	Busy	11
24	Signal ground	19-30 and 33
12	Paper out	12
25	Signal ground	19-30 and 33
13	Select	13

lines before it can send a character. When the signals are stable, the computer sends a pulse on line 1 to tell the printer to accept the character.

The printer sends an acknowledge signal on pin 10 to tell the computer that the character has been received. If the printer cannot receive another character (it is still receiving a character, its buffer is full, etc.), it sets its busy line (pin 11) high. Similar to the busy line is the paper out line (pin 12) that again tells the computer not to send another character.

Finally, pins 17 through 25 provide grounds for the electrical signals that pass along other lines. These should not be used as shield, or chassis, grounds. A ground simply completes the path for electron flow. The term "twisted pair," which you may hear in relation to data communications, refers to a single data line and its associated signal ground line (like the two wires that most of us rely on for telephone service).

You may trade in your 1000 and want to keep old peripherals. Or, if your first Amiga is a 500 or 2000, you may still want to use peripherals designed for the 1000's parallel port. Using the tables in this article, you should be able to construct a simple adapter with two DB-25 male connectors and a few inches of cable for about $5. If you do, be sure to label each end, one for the Amiga 500 and 2000 printer port and one for the Amiga 1000 peripheral.

Why would Commodore bother to make this seemingly arbitrary change? It was, at least in part, for your convenience and mine. The new Amiga printer ports come close to the IBM standard. The female connector allows inexpensive IBM-compatible cables to be used. (Though you will want to disconnect pin 14 in such a cable to use it with most printers. They do not need or appreciate that +5 volts.)

Table 3 shows a standard IBM-compatible DB-25 printer port, along with the appropriate connections to a typical parallel printer with a 36-pin Centronics connector. Let's explain just a couple more pins for readers with a technical bent.

Pin 14 on the Amiga 500 and 2000 carries +5 volts for Amiga peripherals that need to draw their power from the computer. A 36-pin Centronics connector may also carry +5 volts on pin 35, but that pin is not supported by IBM-compatible computers (or by the cables available for them).

On IBM-compatibles, pin 14 is used to feed the paper one line after printing; it sends a linefeed along with the carriage return. Pin 15, if it is used at all, may carry an error signal. Pin 16 resets the printer to its initial state, clearing the print buffer. And the signal on pin 17 must be set low to allow data entry to the printer.

So, don't despair about those 1000-compatible peripherals. All the signals you need are still available from the 500 and 2000. You have the choice to buy one of the available adapters (I've seen them for $20 to $30) or to make your own. □

High Speed 1541 Disk Operation

We can still recall our first experience with the 1541 disk drive. Actually it was a 1540 disk drive that we were running off a VIC 20 back in 1983. We had paid over $400 for it; in view of that princely sum, we were understandably disappointed when we found out that the 1540 was not completely compatible with the C-64 (but that's another story). It wasn't long after the luxury of not using cassette tapes wore off that we realized that the 1540/1 was not the speed demon we had hoped it would be. In fact when applied to the much larger programs of the C-64, the 1541 was downright tedious.

Nevertheless, those were still the days of wonder and the discovery of just what our machines could do. It wasn't long before we actually filled our first box of 10 disks (at $3 to $4 dollars per disk, no less) and started casting about for a usable disk copy program. Those early programs took from 30 to 40 minutes to back up an entire disk. The initial improvements consisted of a reduction in the number of disk swaps needed to copy a disk with a single drive from six to five and finally down to just three.

Conditions pretty well stabilized for about a year until a young man in Germany discovered a high speed serial bus technique and the era of three minute copiers was upon us. These were shortly followed by a variety of fast loaders, some in cartridge form and others on disk. Software publishers latched on to the idea, and very soon most games had a built-in fast loader of some kind. In the end even Commodore saw the light and pretty much corrected the problem with the C-128 and the 1571 disk drive.

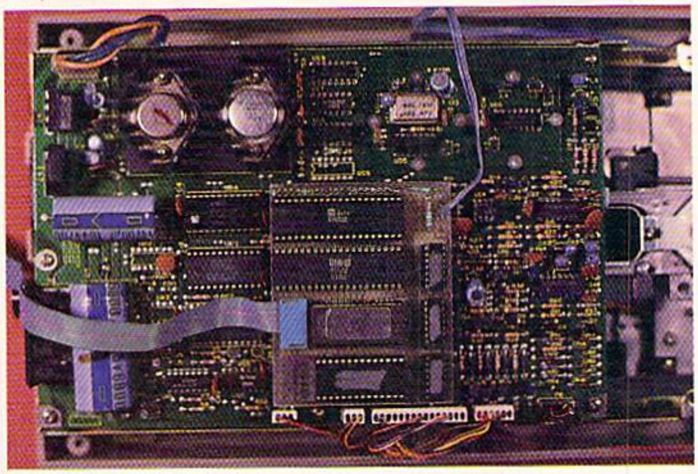
While all these fixes addressed many aspects of the problem, they still did not resolve the basic issue. The 1541's serial bus is essentially slow. Although fast loaders did alleviate the tedium for some applications, most "serious" users of the C-64 obtained very little benefit. Operations involving data files for word processors, spreadsheets and databases were still slow. In particular the saving or writing of data remained a time-consuming process.

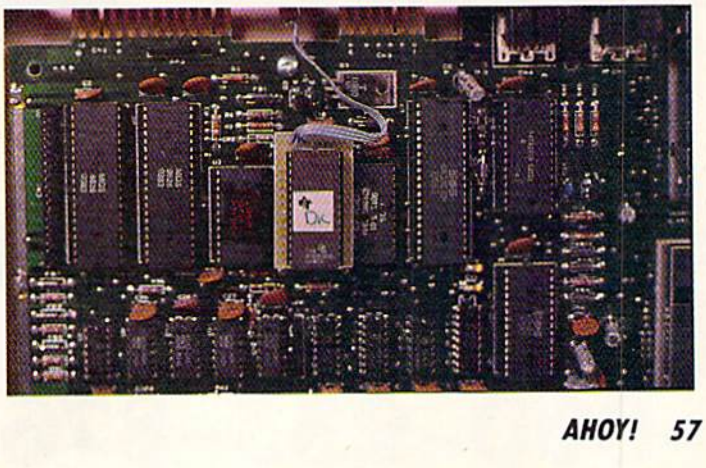
This month we examine four products which accelerate disk drive performance, three of which attack the problem of the serial bus directly. They do this using the most direct method possible, entirely bypassing the serial bus. If you can handle the required hardware hack, one of these products may be the best investment you can make for your C-64 and 1541.

DOLPHIN DOS
Micro Accessories of S. A.
Commodore 64 and 128

We first encountered *Dolphin DOS* at the Summer 1987 MARCA convention. At that time Mark Grove of Grapevine Data Products was doing some pretty impressive things with a C-64 and a 1541 which had *Dolphin DOS* installed. In the course of a few minutes we watched Mr. Grove load and run a selection of C-64 programs at seemingly instantaneous speeds. As it turned out the load times were not instantaneous; however, we were able to count the seconds they took on the fingers of one hand. This was with programs which we knew would take much longer to load under normal circumstances.

We subsequently found out that *Dolphin DOS* came from that land down below, South Australia to be precise, and that it was not available in the U.S. at that time. Since Micro Accessories of S.A. has expressed an interest in the U.S. market, we have decided to present a review of this product. We feel that the encouragement of development along these lines will benefit the Com-





TOP: **Dolphin DOS** *shown installed in the 1541. The 6502 microprocessor and 6522 VIA are from your drive; the additional RAM is at the bottom with the ROM directly above it.*

BOTTOM: **Dolphin DOS** *replacement Kernal with its control switch as installed in the C-64.*

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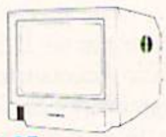
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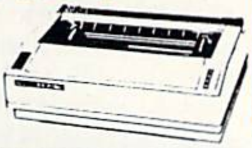
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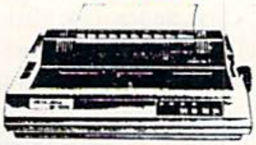
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- Excellent Versatility



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star

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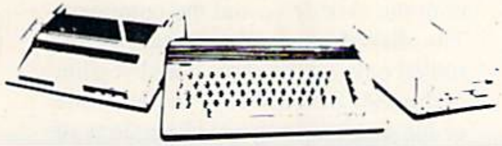


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- Commodore 1541 Drive
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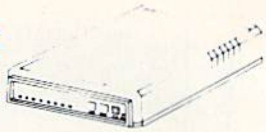
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modore community. Unfortunately, the distribution details for *Dolphin DOS* were still not available as we went to press.

Dolphin DOS is a combination of hardware and firmware which equips a C-64 and a 1541 disk drive with a full 8 bit, high speed parallel interface. When *Dolphin DOS* is installed it endows the computer and disk drive with the ability to load 100 block program files in under three seconds. The save time for this size file clocks in at under seven seconds. These figures represent speed improvements, as compared to the unadorned hardware, of 20 and 10 times respectively. The reading and writing of sequential files is improved by a factor of 10 times. The manipulation of relative files shows the least benefit, with an improvement of only a factor of three. In exchange the C-64 loses the ability to access the cassette recorder, which we feel is a reasonable compromise.

In addition to the raw speed enhancement, *Dolphin DOS* provides some improvements to the operating environment. To start with, the LOAD command defaults to the disk drive as device number 8. Access to the disk commands is simplified by a full-featured DOS wedge. The disk drive's command repertoire is extended to include the locking and unlocking of files, thereby protecting them from inadvertent erasure. In addition the disk drive itself acquires the option to read and write out to track 40. This increases the disk storage capacity by 85 blocks or 21 kilobytes. As an added bonus, the alleged save with replace bug has supposedly been fixed.

Control Key Commands

CTRL B	Cursor to bottom of screen
CTRL G	Cursor 20 columns right
CTRL L	Delete to left of cursor
CTRL K	Delete to right of cursor
CTRL @	Drive status
CTRL D	Display directory
CTRL A	Key repeat toggle
CTRL *	Copy screen to printer
CTRL V	Reset video display
CTRL X	Disable function keys
CTRL &	Enable function keys
CTRL DEL	Copy text to buffer and delete from screen
C=DEL	Retrieve text from buffer

The function keys take on new meaning with *Dolphin DOS*, 12 meanings to be exact. The extra four meanings are accessed by pressing the Commodore key along with a function key. The function keys issue frequently used commands which involve the disk drive, displaying the directory without affecting the contents of memory, loading, running, saving and listing programs to both the screen and the printer, and quick access to the built-in memory monitor and its associated data scroll functions.

Operation of the full screen editor has been enhanced with the inclusion of control key commands. These are listed in the table at left. Note the use of the Commodore key for the last command.

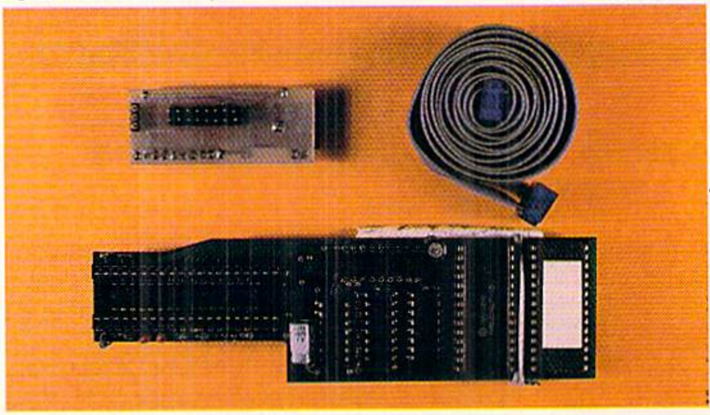
As mentioned above, *Dolphin DOS* is provided with a built-in memory monitor. This is minimal monitor implementation, as it lacks the ability to assemble or disassemble 6502 code. The monitor does provide the capability of displaying and modifying the contents of memory in either hex or ASCII. Instead of scrolling the screen in the usual manner, blocks of data may be paged forward or backward.

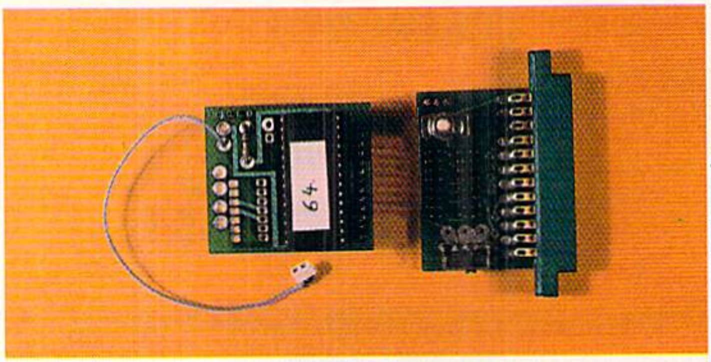
If the computer is fitted with a reset button, then a RESET/SPACE will autostart a program in the $8000 block. BASIC programs can be retained in memory with a RESET/RUN STOP combination. A RESET/1 will fill memory with zeroes, while a RESET/CTRL jumps into the monitor.

The manual also indicates that a Centronics printer connected to the user port is directly supported as device number 4. We did not verify this, as the *Dolphin DOS* user port connector is not provided with a pass through, although one is supposedly available.

With regard to compatibility with commercial software, *Dolphin DOS* performed very well. Most of the programs we tried worked without any problems. If compatibility problems do occur, then *Dolphin DOS* may be manually disconnected in stages as required. The built-in soft switches can be used to cut out the fast load, deselect the extra RAM in the disk drive, and deselect the parallel bus. As a last resort you can electrically switch off *Dolphin DOS* entirely via separate toggle switches on the computer and the disk drive.

Dolphin DOS requires installation in both the disk drive and the computer. The disk drive hardware can be installed only on the short board version of the 1541 disk drive. If you have one of the original long board versions of the 1541, or a 1541C, then *Dolphin DOS* is not for you. To start with, you open





***TOP:* RapiDOS *components in the 1541. Clockwise from top left: circuit board with new 6522 VIA, cable to user port, main circuit board. BOTTOM: In the 64: Kernal ROM on left, user port adapter with control switch to right.* READER SERVICE NO. 232**

up your disk drive and remove the internal radio frequency shield. This should be put aside, as it will not fit once *Dolphin DOS* is installed. The 6502 microprocessor and the adjacent 6522 VIA chips are removed and the *Dolphin DOS* circuit board is installed in the empty sockets. The 6502 and the 6522 are then replaced on the *Dolphin DOS* circuit board.

The 1541 board contains 32 kilobytes of ROM and some additional RAM. We could not determine the exact quantity of add-on RAM, as the chip's identifying marks were removed. A multiconductor ribbon cable is routed out the back of the disk drive to the computer's user port and a very small toggle switch is mounted on the front of the drive. The toggle switch is used to disable *Dolphin DOS* at the disk drive. We had to replace the toggle switch with one of our own, as the original did not survive the installation process.

At the C-64 you will have to remove the original kilobyte Kernal ROM and replace it with the 16 kilobyte ROM which is supplied with *Dolphin DOS.* This may present a problem for many users, as not all C-64's have socketed Kernal ROMs. Kernal ROM replacement may entail the unsoldering of the existing chip and the installation of a socket. The *Dolphin DOS* Kernal ROM actually contains a copy of the C-64's original ROM as well as the replacement Kernal. A miniature toggle switch lets you choose between the two.

Conclusion

Dolphin DOS provides a remarkable improvement in the performance of the 1541 disk drive. If you have the right hardware and you can handle the installation, then go for it. Unfortunately, the lack of the domestic distribution of *Dolphin DOS* may present a real problem. We had to make a trip to the airport just to get our sample through customs.

Micro Accessories of S.A., Unit 8 Hewittson Road, Elizabeth West, South Australia 5113 (phones: 08-287-0191, 08-252-0881). *—Morton Kevelson*

RAPIDOS
Chip Level Designs
Commodore 64
1541 version $49.95; 1541C $59.95

If you've been looking for an alternative to the sloooow operation of the 1541 disk drive, take a close look at *RapiDOS.* This is a hardware/firmware modification to the C-64 and 1541 drive that will make your system zip along at speeds you never thought possible. I know what you're thinking: "Another speed-up system—I'll have to resave all my files in this new format!" You won't have to do that with *RapiDOS.* Unlike the Epyx *Vorpal* system, or *DigiDOS,* this new offering reads and writes in standard Commodore format. It reads practically all that expensive software sitting on your shelves, including all your BASIC programs. And in cases where the software doesn't already have its own fastboot or fastload routines built in, *RapiDOS* will make those programs screech from the disk to RAM. Most of the disk operations required by the software will be executed faster, too. And, you'll get some improvements added to the computer.

Included are three IC chips: one Kernal ROM for the computer and a Kernal ROM and new VIA chip for the drive, as well as a parallel cable and an interface board for the user port of the CPU. The interface board contains a reset button as well as a switch to disable *RapiDOS.* If you're lucky, the CPU Kernal will already be socketed and you can just unplug the old Kernal and plug in the new one. If you're not lucky, you'll need to find someone experienced at soldering to make this change for you. Be forewarned that this modification will void your warranty if it's still in force. As for the drive, both the Kernal ROM and the VIA chip are socketed (except for the 1541C), making this phase of the installation fairly simple. Follow the instructions very carefully and seat the chips properly, lest you bend the leads and make trouble for yourself.

I received a preliminary manual with my *RapiDOS,* but it was very clear and concise. There were step by step instructions and plenty of sketches of all three possible drive models to avoid confusion. These sketches included views of the boards before and after installing *RapiDOS.* I could find no fault with the installation instructions that the manufacturer hadn't already corrected by the time I spoke with him.

The major improvements in the CPU include a DOS wedge, eight predefined function keys (LOAD, SAVE, a DIRECTORY key, LIST, RUN, a key for switching between drives 8 and 9, and a key to disable the function keys), and an IRQ ML monitor. The key definitions were wisely selected. As for the monitor, it displays a screen full of hex as well as the corresponding ASCII characters, and allows for very fast scanning through memory in several directions. While the monitor's command set is quite limited (LOAD, SAVE, CHANGE MEMORY, CONVERT HEX/DECIMAL, ACCESS WEDGE, JUMP TO ML ROUTINE, and EXIT), it is a worthy addition. Other CPU features include options to freeze the screen scrolling, clear to end of line and end of screen, grab a logical screen line and print it elsewhere on screen, switch uppercase to and from lowercase, escape quote/insert mode, and move cursor to bottom left corner of screen. There is a lo-res screen dump (in text mode) always available, and the ability to POKE, PRINT, and calculate in hex, octal, and binary, and do conversions between these three number systems too. The results of the calculations, if printed, are always in decimal, but you would need to upgrade to *RapiDOS Professional* (see following review) to get decimal to hex conversions. Device 8 becomes the default device (no more typing ,8 all the time) and devices 1 and 2 are illegal. Also, the STOP key is much more responsive in aborting a load.

Loads can take many formats: relocating, non-relocating, fast, slow but use parallel lines, first file on disk, and don't change "end of BASIC" pointers. Device 4 is the default device for the OPEN command, and the system will look for a parallel printer first. All keys repeat on the faster RAM power-up, cursor speed is increased by about 25%, fast loads show start and end addresses, and there is an improved AND function algorithm. All these features make *RapiDOS* a fine improvement to the C-64, but the best is yet to come.

As advertised, *RapiDOS* loads BASIC and ML programs at tremendous speeds. 202 block files will load in 15 seconds, compared to 2 minutes and 12 seconds via the serial bus. 59 block files will load in 5 seconds, compared to 38 seconds via the serial bus. File handling from within programs is faster too, although the actual speed is dependent on the logic of the control-

ling program. I tried a 59 block *Speedscript* file (prg file) and got it loaded in 7 seconds instead of 41 seconds. An *Easy Script* file (seq file) of the same size loaded in 15 seconds instead of 43 seconds.

The key to maximizing the speed of *RapiDOS* is that the files must be written in standard Commodore 1541 format, meaning that the interleaving of blocks is critical. Some file copying programs copy files in 1541 format, but the interleaving is different, so *RapiDOS* takes a little longer to load these files (20 seconds for 202 blocks). Files written on the 1571 drive do not use the same interleaving as the 1541, even though a 1541 can read files written on a 1571. Just remember that if the file was *saved* on a 1541, then *RapiDOS* will be most effective. Other drive enhancements include faster head movement and drastically reduced head banging, as well as a 24 second format with full data verification. There is even a "scratch-protect" command that will toggle this flag on a file, thereby eliminating the accidental scratching of a file.

RapiDOS is a complete, professionally developed addition to the C-64/1541 system that any serious user should consider. Compatibility is very high and when there is a problem, returning to the standard C-64/1541 setup is only a reset button away. There is even a measure of compatibility with the 1764 RAM Expander. If you have a second drive (without *RapiDOS*), all the CPU features are still available, including the wedge and function keys.

Chip Level Designs, P.O. Box 603, Astoria, OR 97103-0603 (phone: 503-861-1622). *—Donald Graham*

RAPIDOS PROFESSIONAL
Chip Level Designs
Commodore 64 with 1541
Price: $99.95

If we piqued your interest with *RapiDOS,* and if you want to squeeze the maximum possible performance out of your 1541, you may just be ready for *RapiDOS Professional. RapiDOS Professional* has the same operating features as *RapiDOS* with a few extras thrown in. The most notable addition is the ability to format the disk out to 40 tracks, which adds 85 blocks of storage space. This feature can even be applied to disks which have previously been formatted and already have data on them without losing any of the existing information. If your disk is completely full it will no longer need to be so with *RapiDOS Professional*. Of course 1541s which do not have *RapiDOS Professional* will not be able to access the extra data.

The rest of the additional features are associated with the extra hardware provided with *RapiDOS Professional*. Soft switches let you turn off the extra RAM, the fast save, the write verify, and the full track buffering. These measures may be used to improve compatibility with some software. The disk drive's error channel report has been extended to indicate the status of the extra features. The preliminary manual failed to mention the ability to blank the screen while loading. The command which does the screen blanking is @DL+. The primary purpose of the screen blanking is to provide compatibility with PAL video systems and 50 Hz power supplies.

The bottom line is of course speed, and *RapiDOS Professional* comes through in this regard. A 204 block program file loaded in just 4 seconds and saved in 10 seconds. A 100 block program file barely required 2 seconds to load. Our 50 block test file loaded so fast that it was difficult to get an accurate reading of the time it took. In *Easy Script* we were able to read in a 42 block text file in a bit over six seconds. A side effect of the high transfer speed and the extra RAM in the disk drive is that performance is not affected by the sector interleave.

RapiDOS Professional requires the installation of a substantial amount of hardware in the 1541 disk drive. Soldering should not be required, as all the affected chips will normally be socketed. As with *RapiDOS,* you start by removing the 1541's Kernal ROM and one of the 6522 VIA chips. A modified VIA chip on a custom mounting board is then installed and a parallel cable is hooked up and routed out the back of the drive over the power connector.

The VIA circuit board is a marvel of ingenuity. Some of the chip's pins remain in their default downward orientation and are inserted into the 1541's socket. The remaining pins are bent upward and are connected to an add-on circuit board which rests on the chip's back. A conservative designer might even consider the arrangement to be a real kludge. We look upon it as the product of creative thinking.

Unlike *RapiDOS,* the extracted disk drive Kernal ROM is not directly replaced. Instead the 6502 microprocessor is removed from its socket on the disk drive and a 5½" circuit board is installed in its place. The 6502 is then replaced in a socket on this add-on circuit board. The add-on board is fitted with 32 kilobytes of ROM which contains a copy of the original 1541 Kernal plus the *RapiDOS* operating system for the 1541. The board also adds eight kilobytes of RAM to the disk drive.

Installation of the circuit board in a short board version of the 1541 presented no problems. However, we ran into some difficulties with an original long board version of the drive. The circuit board failed to clear the shield cans of the disk drive's clock by a silly millimeter. We got around the problem by extending the 6502 socket by stacking two additional sockets in it. When the job was done the disk drive's cover

would not fit all the way down. The preliminary manual indicated that a similar modification is required for the 1541C. There are at least four varieties of the 1541 circuit board that we are now aware of. *RapiDOS Professional* should be able to fit in any one of these.

On the computer side you will have to remove the Kernal ROM and replace it with the *RapiDOS Professional* Kernal. This ROM contains a copy of the original C-64 Kernal as well as the *RapiDOS* operating system for the C-64. An adapter board is installed in the user port for the parallel connection to the disk drive. Connectors are provided for use with two disk drives. A miniature slide switch on the user port board disables *RapiDOS* in both the computer and the disk drive. The adapter board does not provide a pass through for the user port. If you wish to use a modem with *RapiDOS Professional*, simply pull out the user port board. This will automatically disable *RapiDOS*. A version of this ROM board is also available for the C-128 in C-64 mode.

RapiDOS Professional will automatically recognize a parallel printer, as device number four, connected to the user port. Data sent to this printer will be automatically translated from PETSCII or ASCII. Chip Level Designs can provide a cable which connects to the disk drive port, located on the user port board, for connection to the printer.

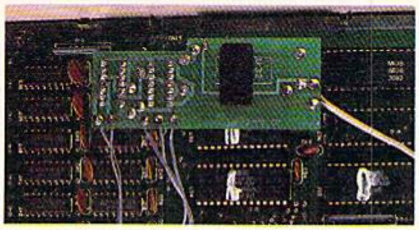
Conclusions

RapiDOS Professional is the most effective device for speeding up the 1541 disk drive which we have seen. This is fortunate, as it is the only device of its kind currently available in this country. Once again Chip Level Designs has demonstrated their expertise as applied to Commodore disk drive technology.

Chip Level Designs, P.O. Box 603, Astoria, OR 97103-0603 (phone: 503-861-1622). *—Morton Kevelson*

C-128 BURST ROM

Chip Level Designs
Commodore 128
Price: $38.95



Burst-ROM ***replaces the C-64 operating system in the C-128. Wires at right lead to control switch; leads at left terminate in C-128 micro-chips.***
READER SERVICE NO. 233

One of the many improvements of the C-128 computer and the 1571 disk drive over the C-64 and 1541 is the increased data transfer speed between the two units. One of the benefits of the C-128 upgrade path is the total compatibility of new hardware with the existing base of C-64 software and peripherals. Unfortunately, the 128's C-64 emulation did not implement the new fast data transfer of the C-128 mode. Now thanks to Chip Level Designs, it is possible to have the best of both worlds.

In the C-128 there is a single 16 kilobyte ROM which contains the entire C-64 operating system. When the C-128 is powered up in C-64 mode, or

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after the GO64 command is executed, the microprocessor executes only the code which is stored in this ROM. The *C-128 Burst-ROM* is a direct replacement for the C-64 mode ROM in the C-128. It is actually a 32 kilobyte ROM which contains a complete copy of the original C-64 ROM in addition to its own Burst-DOS operating system.

The installation of the *C-128 Burst-ROM* is a two step process. First the original C-64 mode ROM is removed and the *C-128 Burst-ROM* circuit board is installed in its place. This should not present a problem, since as far as we know all C-128's have socketed ROMs. However, if your C-128 does have its C-64 ROM soldered in place, skilled surgery will be required. Note that we referred to a replacement circuit board as opposed to a simple ROM. This circuit board carries wires which hook up to other points in the C-128.

To gain access to the ROMs you will have to open up the C-128 and remove the metal radio frequency shield which covers the circuit board. This shield has a number of fingers or tabs which come down and contact the major chips. The installation instructions suggest that the shield be left out to avoid shorting out the *C-128 Burst-ROM's* circuit board. Since the metal fingers serve to remove heat from the major chips, we suggest that the shield be reinstalled with a piece of insulating tape over the *C-128 Burst-ROM.*

To complete the installation, there are five additional wires which have to be connected at various points in the C-128. Each of these wires is terminated in a miniature, spring-loaded test clip which readily grabs hold of a component lead. Two of these wires go to ferrite leads along the back of the board. The instructions suggest that you scrape the connection points before hooking up. We found out the hard way that this was more than a suggestion. The leads seemed to be covered with a factory coating which prevented electrical contact. If you have the necessary skills you may wish to solder the wires in place after testing out the installation. As a side benefit you will have a set of five test clips which can be used elsewhere.

The installation is completed by routing a pair of wires with a miniature slide switch through the cassette port. This switch lets you easily restore the original C-64 operating system whenever it is required. Simply flip the switch and press the C-128's reset button, and you're back in operation.

The presence of *C-128 Burst-ROM* is easily recognized by its gray on black screen colors and the display of starting and ending load addresses whenever a file is loaded in. You may also notice shorter waiting times associated with disk operations. For example, a 59 block program file loads in 6½ seconds with *C-128 Burst-ROM* as compared to 38 seconds without it. Other operations may be speeded up as well. We found a 42 block *Easy Script* file read in 12 seconds with *C-128 Burst-ROM* versus 29 seconds without it.

C-128 Burst-ROM does more than speed up disk operations and display load addresses. In exchange for the loss of the cassette routines, *C-128 Burst-ROM* provides a built-in DOS wedge and other operating enhancements. Disk commands are sent to the drive by simply preceding them with the traditional @ or > wedge characters. The directory may be read without affecting the contents of memory. Even files may be displayed on the screen by the use of the exclamation point as a DOS command, as in @!filename or >!filename. The left SHIFT key or the SHIFT LOCK key may be used to stop screen scrolling.

Additional keyboard enhancements, which involve the CONTROL key, are provided as per the following list:

CONTROL & left arrow: moves the cursor to the bottom left corner.

CONTROL & CLR/HOME: clears to end of screen.

CONTROL & INST/DEL: clears to end of line.

CONTROL & +: grabs rest of screen line into the cassette buffer.

CONTROL & –: reprints the grabbed screen line.

CONTROL & *: performs a text screen dump to serial device 4 or to a user port Centronics printer.

CONTROL & N: switch to upper/lower case.

CONTROL & =: switch to upper case/graphics.

The last two functions come in handy, as the old COMMODORE-SHIFT key combination now works too fast to be easily controlled. In addition, the RUN STOP key will also cancel quote mode. Entering a shifted minus char-

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acter as a direct command will clear and fill memory with $2D. Entering a shifted plus character performs a reset to power up conditions (same as SYS 64738).

For convenience the function keys are programmed with eight commands by *C-128 Burst-ROM.* These let you perform a single keystroke LIST, RUN, or LOAD, display the directory, enter the monitor, disable all the extra features, SAVE, and toggle the active device between 8 and 9. Additional features include base number conversions between decimal, hexadecimal, octal, and binary. There is an improved RND function, all keys repeat, and a faster RAM test is performed on power up.

For machine language programmers there is a built-in memory monitor. This lets you examine and modify the contents of RAM, access the disk drive, and save and load files. The monitor does not include the ability to assemble or disassemble 6502 code. The monitor works in real time, showing the contents of RAM as they actually change.

Overall, *C-128 Burst-ROM* does what it is supposed to. It gives you direct access to the high speed hardware built into the 1571 and 1581 disk drives. Drives not equipped with burst capabilities, such as the 1541, are automatically recognized and may be chained with burst drives. As a bonus you get a full-featured DOS wedge, a functional memory monitor, and a number of other enhancements. If the combination of features and enhancements gets in the way, they can be easily disabled.

Chip Level Designs, P.O. Box 603, Astoria, OR 97103-0603 (phone: 503-861-1622). *–Morton Kevelson*

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listings guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!'s* program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart . The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; C-128 lines, a maximum of 160 characters, 2 or 4 screen lines in 40 or 80 columns respectively). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version for your machine will help you proofread programs after typing them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See instructions preceding each program.)

On the second page following you will find *Flankspeed*, our ML entry program, and instructions on its use.

Call *Ahoy!* at 212-239-6089 with any problems (if busy or no answer after three rings, call 212-239-0855).

WHEN YOU SEE	IT MEANS	YOU TYPE		YOU WILL SEE
[CLEAR]	Screen Clear	SHIFT	CLR/HOME	
[HOME]	Home		CLR/HOME	
[UP]	Cursor Up	SHIFT	↑ CRSR ↓	
[DOWN]	Cursor Down		↑ CRSR ↓	
[LEFT]	Cursor Left	SHIFT	← CRSR →	
[RIGHT]	Cursor Right		← CRSR →	
[SS]	Shifted Space	SHIFT	Space	
[INSERT]	Insert	SHIFT	INST/DEL	
[DEL]	Delete		INST/DEL	
[RVSON]	Reverse On	CNTRL	9	
[RVSOFF]	Reverse Off	CNTRL	0	
[UPARROW]	Up Arrow		↑	↑
[BACKARROW]	Back Arrow		←	←
[PI]	PI		π	π
[EP]	English Pound		£	£

WHEN YOU SEE	IT MEANS	YOU TYPE		YOU WILL SEE
[BLACK]	Black	CNTRL	1	
[WHITE]	White	CNTRL	2	
[RED]	Red	CNTRL	3	
[CYAN]	Cyan	CNTRL	4	
[PURPLE]	Purple	CNTRL	5	
[GREEN]	Green	CNTRL	6	
[BLUE]	Blue	CNTRL	7	
[YELLOW]	Yellow	CNTRL	8	
[F1]	Function 1		F1	
[F2]	Function 2	SHIFT	F1	
[F3]	Function 3		F3	
[F4]	Function 4	SHIFT	F3	
[F5]	Function 5		F5	
[F6]	Function 6	SHIFT	F5	
[F7]	Function 7		F7	
[F8]	Function 8	SHIFT	F7	

BUG REPELLENT FOR THE 64 & 128 By BUCK CHILDRESS

Please note: the *Bug Repellent* programs listed here are for *Ahoy!* programs published from the May 1987 issue onward! For older programs, use the older version.

Type in, save, and run *Bug Repellent.* You'll be asked if you want automatic saves to take place. If so, you're prompted for the device, DISK (D) or TAPE (T). You then pick a starting file number, 0 through 99. Next, you enter a name, up to 14 characters long. At this point, *Bug Repellent* verifies your entries and gives you a chance to change them if you want. If no changes are needed, *Bug Repellent* activates itself. (Pressing RETURN without answering the prompts defaults to disk drive and begins your files with "00BACKUP".)

Type NEW and begin entering an *Ahoy!* program. As you enter program lines and press RETURN, a *Bug Repellent* code appears at the top of your screen. If it doesn't match the code in the program listing, an error exists. Correct the line and the codes will match.

If used, automatic saves take place every 15 minutes. When the RETURN key is pressed on a program line, the screen changes color to let you know that a save will begin in about three seconds. You may cancel the save by pressing the RUN STOP key. The file number increments after each save. It resets to 00 if 99 is surpassed. After saving, or cancelling, the screen returns to its original color and the timer resets for 15 minutes.

When you've finished using *Bug Repellent*, deactivate it by typing SYS 49152 [RETURN] for the Commodore 64 or SYS 4864 [RETURN] for the Commodore 128.

C-64 BUG REPELLENT

```
·10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3"."]":J
=49152
·20 FORB=0TO11:READA:IFA<0ORA>255THEN40
·30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
·40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(64)*256+PEEK(63)
:END
·50 X=0:J=J+12:IFJ<49456THEN20
·60 POKE198,0:POKE49456,0:A$="Y":B$=A$:C$="D":D$="DISK":D
=8:PRINTCHR$(147)
·70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA
$="Y"THEN90
·80 PRINT"NO AUTOMATIC SAVES[3"."]":GOTO150
·90 POKE49456,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THE
ND=1:D$="TAPE"
·100 POKE49457,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (
0-99)";N
·110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
·120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
·130 POKE49458,L:FORJ=1TOL:POKE49458+J,ASC(MID$(F$,J,1)):
NEXTJ:PRINT
·140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
·150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN6
0
·160 POKE770,131:POKE771,164:SYS49152:END
·170 DATA169,79,32,210,255,162,38,160,192,204,3,3,1507
·180 DATA208,10,162,131,160,164,169,70,32,210,255,44,1615
·190 DATA169,78,32,210,255,142,2,3,140,3,3,76,1113
·200 DATA36,193,32,96,165,134,122,132,123,32,115,0,1180
·210 DATA170,240,243,162,255,134,58,144,3,76,150,164,1799
·220 DATA32,107,169,32,121,165,173,0,2,240,5,169,1215
·230 DATA79,141,2,3,76,162,164,169,0,133,2,133,1064
·240 DATA251,133,252,133,254,24,101,20,69,254,230,254,197
5
·250 DATA24,101,21,69,254,170,230,254,164,252,185,0,1724
·260 DATA2,133,253,201,34,208,6,165,2,73,255,133,1465
·270 DATA2,201,32,208,4,165,2,240,8,138,24,101,1125
·280 DATA253,69,254,170,44,198,254,230,252,164,253,208,23
49
·290 DATA213,138,41,240,74,74,74,74,24,105,129,141,1327
·300 DATA44,193,138,41,15,24,105,129,141,45,193,162,1230
·310 DATA0,189,43,193,240,12,157,0,4,173,134,2,1147
·320 DATA157,0,216,232,208,239,169,38,141,2,3,173,1578
·330 DATA48,193,240,23,165,161,201,212,176,4,165,160,1748
·340 DATA240,13,238,32,208,160,0,32,225,255,208,6,1617
·350 DATA32,33,193,76,38,192,232,208,242,200,208,239,1893
·360 DATA32,68,229,169,0,168,174,49,193,32,186,255,1555
·370 DATA173,50,193,162,51,160,193,32,189,255,169,43,1670
·380 DATA166,45,164,46,32,216,255,162,1,189,51,193,1520
·390 DATA168,200,152,201,58,144,2,169,48,157,51,193,1543
·400 DATA201,48,208,3,202,16,234,32,33,193,76,116,1362
·410 DATA164,206,32,208,169,0,170,168,76,219,255,160,1827
·420 DATA1,1,160,0,0,65,72,79,89,33,0,0,500
```

C-128 BUG REPELLENT

```
·10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3"."]":J
=4864
·20 FORB=0TO11:READA:IFA<0ORA>255THEN40
·30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
·40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(66)*256+PEEK(65)
:END
·50 X=0:J=J+12:IFJ<5213THEN20
·60 POKE208,0:POKE5213,0:A$="Y":B$=A$:C$="D":D$="DISK":D=
8:PRINTCHR$(147)
·70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA
$="Y"THEN90
·80 PRINT"NO AUTOMATIC SAVES[3"."]":GOTO150
·90 POKE5213,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THEN
D=1:D$="TAPE"
·100 POKE5214,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (0
-99)";N
·110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
·120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
·130 POKE5215,L:FORJ=1TOL:POKE5215+J,ASC(MID$(F$,J,1)):NE
XTJ:PRINT
·140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
·150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN6
0
·160 POKE770,198:POKE771,77:SYS4864:END
·170 DATA32,58,20,169,41,162,19,236,3,3,208,4,955
·180 DATA169,198,162,77,141,2,3,142,3,3,224,19,1143
·190 DATA208,7,32,125,255,79,78,0,96,32,125,255,1292
·200 DATA79,70,70,0,96,162,0,134,251,189,0,2,1053
·210 DATA240,19,201,48,144,9,201,58,176,5,133,251,1485
·220 DATA232,208,238,134,252,165,251,208,3,76,198,77,2042
·230 DATA169,0,166,235,164,236,133,253,133,254,142,47,193
2
·240 DATA20,140,48,20,24,101,22,69,254,230,254,24,1206
·250 DATA101,23,69,254,170,230,254,164,252,185,0,2,1704
·260 DATA133,251,201,34,208,6,165,253,73,255,133,253,1965
·270 DATA201,32,208,4,165,253,240,8,138,24,101,251,1625
·280 DATA69,254,170,44,198,254,230,252,164,251,208,213,23
07
·290 DATA138,41,240,74,74,74,74,24,105,65,141,88,1138
·300 DATA20,138,41,15,24,105,65,141,89,20,32,79,769
·310 DATA20,189,85,20,240,6,32,210,255,232,208,245,1742
·320 DATA174,47,20,172,48,20,24,32,240,255,173,93,1298
·330 DATA20,240,27,165,161,201,212,176,4,165,160,240,1771
·340 DATA17,32,65,20,238,32,208,238,1,214,32,225,1322
·350 DATA255,208,6,32,49,20,76,198,77,232,208,242,1603
·360 DATA200,208,239,32,66,193,173,95,20,162,96,160,1644
·370 DATA20,32,189,255,169,0,170,32,104,255,169,0,1395
·380 DATA174,94,20,168,32,186,255,169,45,174,16,18,1351
·390 DATA172,17,18,32,216,255,162,1,189,96,20,168,1346
·400 DATA200,152,201,58,144,2,169,48,157,96,20,201,1448
·410 DATA48,208,3,202,16,234,32,49,20,141,0,2,955
·420 DATA76,183,77,58,59,32,65,20,206,32,208,206,1222
·430 DATA1,214,169,0,170,168,76,219,255,32,79,20,1403
·440 DATA169,26,141,0,214,173,0,214,16,251,96,162,1462
·450 DATA0,142,0,255,96,19,18,32,32,32,32,146,804
·460 DATA0,1,0,0,65,72,79,89,33,0,0,0,339
```

FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1–SAVEs what you have entered so far.

f3–LOADs in a program worked on previously.

f5–To continue on a line you stopped on after LOADing in the previous saved work.

f7–Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. It temporarily freezes the output as well.

```
100 POKE53280,12:POKE53281,11                                  OP
105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]";        FP
110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "
 ]"                                                            JP
115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]"           FA
120 PRINT"[RVSON][3" "]COPR. 1987, ION INTERNATIONAL INC.
 [3" "]"                                                       AJ
125 FORA=54272TO54296:POKEA,0:NEXT                             ND
130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
 KE54296,15                                                    NP
135 FORA=680TO699:READB:POKEA,B:NEXT                           FL
140 DATA169,251,166,253,164,254,32,216,255,96                  FF
145 DATA169,0,166,251,164,252,32,213,255,96                    EK
150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B            KP
155 GOSUB480:IFB=0THEN150                                      OE
160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16                  AM
165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B                   PE
170 GOSUB470:IFB=0THEN150                                      PG
175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16                      GM
180 IFB>255THENB=B-255:POKE254,PEEK(254)+1                     HG
185 POKE253,B:PRINT                                            EC
190 REM  GET HEX LINE                                          ED
195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8                   KD
200 FORB=0TO1:GOTO250                                          IH
205 NEXTB                                                      IJ
210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340                      FA
215 PRINT" [c P][LEFT]";                                       EG
220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "                      II
225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255                     GL
230 NEXT                                                       GI
235 IFA%(8)<>TTHENGOSUB375:GOTO195                             FL
240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195              IM
245 REM    GET HEX INPUT                                       PA
250 GETA$:IFA$=""THEN250                                       GA
255 IFA$=CHR$(20)THEN305                                       GO
260 IFA$=CHR$(133)THEN535                                      LM
265 IFA$=CHR$(134)THEN560                                      IG
270 IFA$=CHR$(135)THENPRINT" ":GOTO620                         HO
275 IFA$=CHR$(136)THENPRINT" ":GOTO635                         HE
280 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO295               MI
285 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO295               DJ
290 GOSUB415:GOTO250                                           JA
295 PRINTA$"[c P][LEFT]";                                      PK
300 GOTO205                                                    FA
305 IFA>0THEN320                                               BI
310 A=-1:IFB=1THEN330                                          BB
315 GOTO220                                                    FA
320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1                     BF
325 A=A-1                                                      FK
330 PRINTCHR$(20);:GOTO220                                     PH
335 REM LAST LINE                                              CP
340 PRINT" ":T=AD-(INT(AD/256)*256)                            KH
345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255                   OD
350 NEXT                                                       OB
355 IFA%(A)<>TTHENGOSUB375:GOTO195                             LH
360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT                            BO
365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535                     MB
370 REM BELL AND ERROR MESSAGES                                LM
375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415        JK
380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415            PG
385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41
 5                                                             IK
390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
 GOTO415                                                       HK
395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415             DM
400 PRINT"?ERROR IN SAVE":GOTO415                              JK
405 PRINT"?ERROR IN LOAD":GOTO415                              IO
410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT                    JO
415 POKE54276,17:POKE54276,16:RETURN                           BF
420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN           DH
425 REM GET FOUR DIGIT HEX                                     IM
430 PRINT:PRINTB$;:INPUTT$                                     OL
435 IFLEN(T$)<>4THENGOSUB380:GOTO430                           JD
440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
 380:GOTO430                                                   AK
445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN        KB
450 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RETURN                GM
455 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RETURN                NJ
460 T(A)=16:RETURN                                             IC
465 REM ADDRESS CHECK                                          OL
470 IFAD>ENTHEN385                                             HO
475 IFB<SRORB>ENTHEN390                                        LE
480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395               OB
485 RETURN                                                     HE
490 REM ADDRESS TO HEX                                         PM
495 AC=AD:A=4096:GOSUB520                                      AP
500 A=256:GOSUB520                                             NF
505 A=16:GOSUB520                                              LG
510 A=1:GOSUB520                                               HE
515 RETURN                                                     JD
520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530                 OC
525 A$=CHR$(T+48)                                              JI
530 PRINTA$;:AC=AC-A*T:RETURN                                  AA
535 A$="**SAVE**":GOSUB585                                     IC
540 OPEN1,T,1,A$:SYS680:CLOSE1                                 AB
545 IFST=0THENEND                                              FB
550 GOSUB400:IFT=8THENGOSUB420                                 PM
555 GOTO535                                                    FI
560 A$="**LOAD**":GOSUB585                                     PE
565 OPEN1,T,0,A$:SYS690:CLOSE1                                 PO
570 IFST=64THEN195                                             OI
575 GOSUB405:IFT=8THENGOSUB420                                 CO
580 GOTO560                                                    GN
585 PRINT" ":PRINTTAB(14)A$                                    KA
590 PRINT:A$="":INPUT"FILENAME";A$                             IO
595 IFA$=""THEN590                                             HK
600 PRINT:PRINT"TAPE OR DISK?":PRINT                           HL
605 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RETURN               NP
610 IFB$<>"T"THEN605                                           KO
615 RETURN                                                     PH
620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B                   DD
625 GOSUB475:IFB=0THEN620                                      NK
630 PRINT:GOTO195                                              HN
635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B                   FK
640 GOSUB475:IFB=0THEN635                                      LN
645 PRINT:GOTO670                                              HI
650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
 OSUB410:GOTO195                                               LM
655 PRINT" ";:NEXTB                                            LE
660 PRINT:AD=AD+8                                              CD
665 GETB$:IFB$=CHR$(136)THEN195                                JD
670 GOSUB495:PRINT": ";:GOTO650                                KE
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 67 and 68 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

TIME SUBWAY

FROM PAGE 47

```
·10 POKE56,62:CLR:POKE53280,.:POKE53281,.
:PRINTCHR$(8)CHR$(142):X=RND(TI)            AM
·20 POKE53248+21,255:POKE53248+21,.:SYS65
418:GOSUB1010:PL=49847:A=52224:B=52480      KB
·30 FORX=ATOB:READD:POKEX,D:NEXT:A=49152:
B=49970:FORX=ATOB:READD:POKEX,D:NEXT        HD
·40 A=248*64:B=A+7*64:FORX=ATOB:READD:POK
EX,D:NEXT                                   AN
·50 PRINT"[3"[DOWN]"][RIGHT][RIGHT][c 7]B
ASED ON A CONCEPT BY LYNWOOD BROOKS"        HO
·60 FORX=.TO63:POKE832+X,.:POKE896+X,255:
POKE960+X,255:NEXT:POKE864,16               GD
·70 FORX=2TO63STEP3:POKE896+X,.:NEXT:POKE
864,16:POKE867,16                           NE
·80 PRINT"[RIGHT][RIGHT][c 5]PROGRAMMED B
Y CLEVELAND M. BLAKEMORE";:SYSPL,.,16:GO
SUB1100                                     EM
·90 PRINT"[HOME][DOWN][DOWN][3"[RIGHT]"][
c 5][s U][s C][s I][DOWN][3"[LEFT]"][s B
] [s B][DOWN][3"[LEFT]"][s J][s C][s K]"
:PRINTTAB(32)"[3"[UP]"][s U][s C][s I][D
OWN][3"[LEFT]"][s B] [s B][DOWN][3"[LEFT
]"][s J][s C][s K][WHITE]"                  JA
·100 SYSPL,10,9:PRINT"[c 7]PRESS FIRE TO
BEGIN[WHITE]"                               LL
·110 A$(.)="[s B]":A$(1)="[s N]":A$(2)="[
s C]":A$(3)="[s M]":X=.                     EJ
·120 SYS52224,1,16,21:PRINT"[HOME][3"[DOW
N]"]"TAB(4)A$(X)TAB(33)A$(X):X=X+1+(X=3)
*4                                          BC
·130 ON-((PEEK(56320)AND16)>.)GOTO120:PRI
NT"[CLEAR]"                                 HB
·140 DIM V,P,Y,J,R,U,E,D,H,W,I,L,SP,N,LX,
LY,G,M,S,S$(47),D(1),T(47),SC(3)            PJ
·150 V=53248:J=56320:SC=52224:M=1988:S=54
272:D(.)=-1:D(1)=1:N=209:U=1:E=2:G=4        OD
·160 H=64:L=100:LX=172:LY=200:I=.025:SP=1
337                                         FA
·170 FORX=.TO3:READSC(X):NEXT:READA$(.),A
$(1)                                        PN
·180 FORX=1TO45:READT(X),S$(X):NEXT         EF
·190 XS=49634:YS=49647:TG=49660:FL=49673:
CF=49692:MD=49711:SS=49755:SB=49774         EH
·200 DEFFNF(X)=-((PEEK(J)AND16)>.):DEFFNM
(X)=(PEEK(V+21)AND16)=.                     LG
·210 DEFFNP(X)=PEEK(V+16)AND239             IN
·220 SYS49805,255,.                         JD
·230 SYSXS,41,21:SYSYS,123,214:SYSTG,6,14
:SYSFL,0,0,0:SYSCF,16,31,14:SYSSS,4,3       GI
·240 POKE2040,248:POKE2044,13:POKE2045,14
:POKE2046,15:POKE2047,248                   IA
·250 POKEV+28,143:POKEV+37,1:POKEV+38,11:
POKEV+39,10:POKEV+43,1                      KB
·260 POKEV+44,.:POKEV+45,.:POKEV+46,9:POK
EV+10,160:POKEV+11,115                      FA
·270 POKEV+12,160:POKEV+13,103:POKEV+14,1
72:POKEV+15,200:POKEV+23,32:POKEV+29,96     IC
·280 Y=M:D=.:W=.:GOSUB990                   NC
·290 GOSUB1170:GOSUB1260:GOSUB1390          FN
·300 P=129:A$="99599592":GOSUB1420          JH
·310 POKEV+16,.:POKEV+10,168:POKEV+11,115
:POKEV,172:POKEV+1,87                       OE
·320 POKEV+21,33:POKEV+27,223:GOSUB1300:P
OKEV+27,222:GOSUB1370:GOSUB1320             GM
·330 X=(Y=T(HX)):POKEV+21,65+(X<>.)*-128+
(X=.)*-14:R=(X=.)*-.8                       MF
·340 FORA=.TO9:A=PEEK(V+30):A=PEEK(V+31):
NEXT:SYSFL,0,1,1:SYS49152                   JC
·350 P=129:A$="[3"1"]455808101101101101101
1101":GOSUB1420:FORA=.TO3:SYSSS,A,1:NEXT IA
·360 REM MAIN LOOP FOR SUBWAY PLATFORM      MC
·370 SYSSC,D,E,7:IFRND(U)>RTHENSYSMD,RND(
U)*4+U,RND(U)*8+U                           DD
·380 IFXTHENIFFNM(.)THENPOKEV+16,FNP(.):P
OKEV+8,LX:POKEV+9,LY:POKEV+21,N             OO
·390 W=W+I:A=PEEK(V+30):B=PEEK(V+31):IFW>
LOR((AANDU)=UAND(AANDH)=.)THEN410           DK
·400 ONFNF(.)GOTO370:ON((BANDU)=U)*-U+(A=
H+U)*-EGOTO550,820:GOTO370                  OH
·410 FORX=.TO3:SYSSS,X,.:NEXT:POKES+6,96:
POKES+24,15:POKES+4,33                      FE
·420 FORX=.TO255STEP5:POKES,X:POKES+1,255
-X:NEXT:POKES+4,32                          BK
·430 FORX=.TO96:POKEV+32,XAND15:NEXT        CL
·440 ON-(A=129ORA=145)GOTO510:ON-(W<L)GOT
O540:SYSPL,9,9:POKE198,.                    GH
·450 REM TIME DISTORTION REACHES 100%       DJ
·460 PRINT"[RED]TIME DISTORTION [WHITE]10
0% [RED]!!"                                 MH
·470 P=33:FORD=.TO4:A$="121205":GOSUB1420
:NEXT                                       NJ
·480 PRINTTAB(12)"[DOWN][DOWN][RED]PLAY A
GAIN (Y/N)[c 7]"                            EH
·490 WAIT198,1:GETA$:IFA$="Y"THENRUN        ID
·500 POKE679,.:SYS679                       CD
·510 REM FOUND DOCTOR                       PC
·520 PRINT"[CLEAR]":SYSPL,2,9:PRINT"[c 3]
YOU HAVE STOPPED THE CRAZED DOCTOR!!"       JF
·530 POKE198,.:P=33:FORD=.TO2:A$="2513314
21502421502":GOSUB1420:NEXT:GOTO470         PB
·540 GOSUB990:Y=INT(RND(U)*M)+U:SYSCF,16,
30,14:POKEV+17,11:GOTO880                   OB
·550 FORX=.TO3:SYSSS,X,.:NEXT:POKEV+21,.    BB
·560 PRINT"[CLEAR][YELLOW][RIGHT][c A]";:
FORX=.TO35:PRINT"[s C]";:NEXT:PRINT"[c S
]"                                          NB
```

```
•570 FORX=.TO20:PRINTTAB(1)"[s B]"TAB(38)
"[s B]":NEXT                                MB
•580 PRINT"[RIGHT][c Z]";:FORX=.TO35:PRIN
T"[s C]";:NEXT:PRINT"[c X][HOME]"           OM
•590 SYSPL,7,22:PRINT"[c 5]TIME DISTORTIO
N FACTOR:[WHITE]";:GOSUB960:PRINT"%"        ME
•600 SYSPL,2,2:PRINT"[RVSON][YELLOW] SPAC
E-TIME CONTINUUM SUBWAY SYSTEM ":SYSPL,1
0,4                                         HM
•610 PRINT"STATION: [WHITE]";:A$=STR$(Y):
GOSUB940:PRINT" A.D.":X=FRE(.)              ME
•620 P=33:A$="08[3"1"]2113211":GOSUB1420   DO
•630 A=.:FORX=1TO45:IFY=T(X)THENA=X         FM
•640 NEXT:IFA=.THEN670                      DI
•650 SYSPL,3,6:PRINT"[c 8]SIGNIFICANT EVE
NT THIS TIME FRAME:"                        GG
•660 SYSPL,20-(LEN(S$(A))/2),8:PRINT"[WHI
TE]"S$(A):GOTO680                           PP
•670 SYSPL,2,6:PRINT"[c 4]NO SIGNIFICANT
EVENT AT THIS STATION"                      AM
•680 SYSPL,2,10:PRINT"[c 3]THERE IS A HUM
AN PRESENCE REGISTERED"                     FD
•690 SYSPL,7,11:PRINT"IN THE VICINITY OF
THE ERA"                                    GD
•700 SYSPL,9,12:PRINT"MARKED BY THE EVENT
[3"."]"                                     ND
•710 P=17:A$="401401401401":GOSUB1420       BO
•720 PRINTTAB(20-(LEN(S$(HX))/2))"[WHITE]
[DOWN]"S$(HX):A$=STR$(T(HX)):PRINTTAB(15
)"[c 5]";                                   LE
•730 GOSUB940:PRINT" A.D."                  CO
•740 SYSPL,8,17:PRINT"[RED]"A$(.):SYSPL,3
2,17:PRINTA$(1)                             NB
•750 SYSPL,15,18:PRINT"[c 5]S U B W A Y":
SYSPL,15,19:PRINT"[c 8]M O T I O N"         PO
•760 A=USR(.)                               DP
•770 IFA=3THEND=1:SYSPL,32,17:PRINT"[c 3]
"A$(1):SYSPL,8,17:PRINT"[RED]"A$(.)         LH
•780 IFA=7THEND=.:SYSPL,32,17:PRINT"[RED]
"A$(1):SYSPL,8,17:PRINT"[c 3]"A$(.)         FE
•790 IFA=3ORA=7THENP=33:A$="991":GOSUB142
0                                           DA
•800 ON-((PEEK(J)AND16)>.)GOTO760:P=17:A$
="424242":GOSUB1420:GOSUB1170:GOTO330       HN
•810 REM SUBWAY TIME TRAVEL                 OG
•820 SYSFL,0,1,0:POKEV,172:POKEV+1,124:P=
33:A$="50":GOSUB1420                        JP
•830 SYSSC,D,2,7:FORA=.TO20:NEXT:IFPEEK(S
P)<>186ORPEEK(SP+U)<>21THEN830              GP
•840 GOSUB1390                              KB
•850 POKEV+21,PEEK(V+21)OR32:GOSUB1300:GO
SUB1340:POKEV+27,PEEK(V+27)OR1              KI
•860 GOSUB1320:POKEV+21,PEEK(V+21)AND254    FD
•870 FORX=90TO10STEP-1:SYSSC,D,2,7:FORB=.
TOX:NEXT:NEXT:POKEV+17,11                   HI
•880 POKEV+21,.:PRINT"[CLEAR][c 4]";:FORA
=.TO3:GOSUB1230:GOSUB1240:NEXT:PRINT:GOS
UB1100                                      FG
•890 PRINT"[c 4]";:FORA=.TO3:GOSUB1230:GO
SUB1240:NEXT:POKEV+17,27:A=9:B=14           JO
•900 SYSSC,D,A,B:Y=Y+D(D)+(Y=MANDD=U)*(M+
U)+(Y=.ANDD=.)*-(M+U):A$=STR$(Y)            KE
•910 W=W+I:ON-(W>L)GOTO440:PRINT"[HOME][D
OWN][DOWN]"TAB(17)"[RVSON][WHITE]";:GOSU
B940:ONFNF(.)GOTO900                        LH
•920 GOTO290                                LO
•930 REM RIGHT JUSTIFIED YEAR               LH
•940 PRINTRIGHT$("[4" "]"+(RIGHT$(A$,LEN(
A$)-U)),G);:X=FRE(.):RETURN                 LC
•950 REM RIGHT JUSTIFIED TIME DISTORTION    OP
•960 A$=STR$(INT(W)):PRINTRIGHT$("[3"0"]"
+(RIGHT$(A$,LEN(A$)-1)),3);                 HN
•970 X=FRE(.):RETURN                        ND
•980 REM RANDOM LOCATION IN TIME            BM
•990 HX=INT((RND(1)*39)+1):RETURN           KJ
•1000 REM TITLE                             OA
•1010 PRINT"[CLEAR]"TAB(4)"[WHITE]EVERY S
ECOND COUNTS ABOARD THE[3"."][DOWN]"        NF
•1020 PRINTTAB(12)"[WHITE][c A][c R][c S]
 [c R] [c A][c S][c A][c S] [c R][s C][c
 S]"                                        PP
•1030 PRINTTAB(12)"[c 8] [s B]  [s B] [s
B][c Z][c X][s B] [c Q][c W] "              GH
•1040 PRINTTAB(12)"[c 8] [c E]  [c E] [c
E]  [c E] [c E][s C][c X]"                  KO
•1050 PRINTTAB(10)"[c 5][c A][s C][c S][c
 R] [c R][c R][s C][c S][c R]  [c R][c A
][s C][c S][c S] [c A]"                     HE
•1060 PRINTTAB(10)"[c 4][c Z][s C][c S][s
 B] [s B][c Q][s C][c W][s B][c A][c S][
s B][c Q][s C][c W][c Z][c R][c X]"         JC
•1070 PRINTTAB(10)"[c 4][c Z][s C][c X][c
 Z][s C][c X][c E][s C][c X][c Z][c X][c
 Z][c X][c E] [c E] [c E] "                 JG
•1080 PRINTTAB(12)"[c 7][DOWN]PLEASE STAN
D BY!"                                      NH
•1090 PRINTTAB(4)"[c 8][DOWN](C) 1988 CLE
VELAND M. BLAKEMORE[8"[DOWN]"]":RETURN      BO
•1100 PRINT"[RVSON][c 8]";:FORX=.TO39:PRI
NTCHR$(183);:NEXT                           CM
•1110 PRINT" [s U][5"[s C]"][s I] [s U][5
"[s C]"][s I] [s U][5"[s C]"][s I] [s U]
[5"[s C]"][s I] [c 5][6":"][c 8] ";         MF
•1120 PRINT" [s J][5"[s C]"][s K] [s J][5
"[s C]"][s K] [s J][5"[s C]"][s K] [s J]
[5"[s C]"][s K] [c 5]:[c 4][c A][s C][s
C][c S][c 5]:[c 8] ";                       NB
•1130 PRINT"[c 4][33"[c R]"][c 5]:[c 4][c
 Z][s C][s C][c X][c 5]:[c 4][c R]";        IN
•1140 PRINT"[33"[c E]"][c 5]:[c 4] [s W][
s W] [c 5]:[c 4][c E]";                     ED
•1150 PRINT"[c 8][33"[c A]"][c 5]:[c 4][4
"[s R]"][c 5]:[c 8][c A]":RETURN            CA
•1160 REM SUBWAY PLATFORM                   EC
•1170 POKEV+17,11:POKE646,SC(YAND3)         HA
•1180 PRINT"[CLEAR]";:GOSUB1230:GOSUB1240
```

```
:PRINT"[5"[DOWN]"]";:GOSUB1240:GOSUB1230
:FORX=.TO6                                   AF
·1190 PRINT"[s O][s P]"SPC(36)"[s O][s P]
[s P][s O]"SPC(36)"[s P][s O]";:NEXT:GOS
UB1230:PRINT"[LEFT]";:GOSUB1230            KG
·1200 POKE2023,208:PRINT"[HOME][DOWN][DOW
N]";:GOSUB1100                             CJ
·1210 SYSPL,34,13:PRINT"[RVSON][YELLOW][c
 K][c 4][c A][s C][c S][DOWN][4"[LEFT]"]
[YELLOW][c K][c 4][s B]I[s B][DOWN][4"[L
EFT]"][YELLOW][c K][c 4][s B]N[s B][DOWN
][4"[LEFT]"][YELLOW][c K][c 4][s B]F[s B
][DOWN][4"[LEFT]"][YELLOW][c K][c 4][s B
]O[s B]";                                  GG
·1220 PRINT"[DOWN][4"[LEFT]"][YELLOW][c K
][c 4][c Z][s C][c X]":SYSPL,17,8:PRINT"
[6" "]":POKEV+17,27:RETURN                 BN
·1230 FORX=.TO19:PRINT"[RVSON][s O][s P]"
;:NEXT:RETURN                              CD
·1240 FORX=.TO19:PRINT"[RVSON][s P][s O]"
;:NEXT:RETURN                              AP
·1250 REM SETUP CROWD OF ALIEN NASTIES     JI
·1260 FORX=.TO3:SYSSS,X,0:NEXT:POKEV+16,.
:FORX=1TO3:SYSMD,X,RND(1)*8+1:NEXT         KJ
·1270 FORX=1TO3:POKEV+X*2,X*85:POKEV+X*2+
1,214                                      FD
·1280 SYSSB,X,249+INT(RND(1)*3)*2,1:POKEV
+39+X,(RND(1)*6)+2:NEXT:RETURN             PB
·1290 REM SUBWAY DOOR UP                   EC
·1300 FORX=115TO82STEP-1:POKEV+11,X:FORA=
.TO30:NEXTA,X:RETURN                       HE
·1310 REM SUBWAY DOOR DOWN                 BI
·1320 FORX=82TO115:POKEV+11,X:FORA=.TO30:
NEXTA,X:RETURN                             AN
·1330 REM PROFESSOR IN                     AN
·1340 SYSCF,16,30,14:FORX=124TO87STEP-1:P
OKEV+1,X:FORA=.TO30:NEXTA                  KI
·1350 NEXT:RETURN                          JI
·1360 REM PROFESSOR OUT                    KB
·1370 FORX=87TO124:POKEV+1,X:FORA=.TO30:N
EXTA,X:SYSCF,16,31,14:RETURN               KI
·1380 REM SLOW DOOR DOWN TO READY POSITIO
N                                          NP
·1390 FORX=10TO105+(D=U)*-8:FORB=.TOX:NEX
T:SYSSC,D,2,7:NEXT                         DD
·1400 P=33:A$="500":GOSUB1420:RETURN       JF
·1410 REM SID STRING TONE GENERATOR        LF
·1420 POKES+6,96:POKES+24,15               KN
·1430 FORA=1TO18STEP3                      DN
·1440 POKES+1,VAL(MID$(A$,A,2)):POKES+4,P CK
·1450 FORB=1TO80*VAL(MID$(A$,A+2,1)):NEXT KE
·1460 POKES+4,P-1:NEXT:A=FRE(.):RETURN     HK
·1470 REM SCROLL DATA                      DC
·1480 DATA 32,241,183,138,74,8,32,241,183
,224,25,144                                PJ
·1490 DATA 2,162,24,142,246,7,32,241,183,
224,25,144                                 EH
·1500 DATA 2,162,24,142,247,7,138,174,246
```

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,7,172,247                                 EG
·1510 DATA 7,56,237,246,7,176,8,73,255,17
4,247,7                                    FN
·1520 DATA 172,246,7,133,254,40,8,144,3,2
00,152,170                                 EF
·1530 DATA 189,203,204,133,98,189,229,204
,133,97,40,8                               OI
·1540 DATA 144,8,233,1,133,97,176,2,198,9
8,165,98                                   AD
·1550 DATA 41,3,9,4,40,8,32,134,204,40,8,
165                                        IN
·1560 DATA 97,144,10,105,39,133,97,144,12
,230,98,176                                NA
·1570 DATA 8,233,39,133,97,176,2,198,98,1
65,98,41                                   OK
·1580 DATA 3,9,216,40,8,32,134,204,198,25
4,16,206                                   AC
·1590 DATA 40,96,133,98,144,3,76,171,204,
160,,177                                   IH
·1600 DATA 97,170,160,39,177,97,72,138,14
5,97,104,170                               LK
·1610 DATA 136,16,245,24,165,97,105,40,13
3,97,144,2                                 AP
·1620 DATA 230,98,96,56,165,97,233,40,133
,97,176,2                                  GJ
·1630 DATA 198,98,160,40,177,97,170,160,1
,177,97,72                                 IK
·1640 DATA 138,145,97,104,170,200,192,41,
208,243,96,4                               OO
·1650 DATA 4,4,4,4,4,4,5,5,5,5,5,5         MK
·1660 DATA 6,6,6,6,6,6,6,7,7,7,7,7         GH
·1670 DATA 7,,40,80,120,160,200,240,24,64
,104,144                                   JH
·1680 DATA 184,224,8,48,88,128,168,208,24
8,32,72,112                                GE
·1690 DATA 152,192,232,,.                  IP
·1700 REM INTERRUPT DATA                   CE
·1710 DATA 120,169,33,141,20,3,169,192,14
1,21,3,169,154,141,17,3,169,194            JM
·1720 DATA 141,18,3,173,36,195,133,251,16
9,1,141,37,195,88,96,198,251,208           CB
·1730 DATA 44,173,36,195,133,251,173,38,1
95,240,34,162,7,189,197,194,45,39          FC
·1740 DATA 195,240,21,189,1,195,24,125,17
,195,157,248,7,222,17,195,16,6             ME
·1750 DATA 189,9,195,157,17,195,202,16,22
4,173,40,195,208,3,76,140,192,162          LN
·1760 DATA .,173,41,195,240,9,169,1,77,37
,195,141,37,195,170,189,,220               HB
·1770 DATA 41,15,133,253,169,15,56,229,25
3,168,185,25,195,240,17,141,168,2          LA
·1780 DATA 168,185,196,194,61,48,195,240,
5,138,168,32,162,192,169,7,141,167         CL
·1790 DATA 2,172,167,2,185,241,194,240,6,
141,168,2,32,162,192,76,46,193             GP
·1800 DATA 185,197,194,45,50,195,208,16,1
73,168,2,10,170,189,205,194,8,152          MG
·1810 DATA 10,170,40,76,192,192,152,10,17
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0,189,223,194,48,26,240,45,185,249          DC
·1820 DATA 194,24,125,,208,157,,208,144,3
3,185,197,194,77,16,208,141,16              ND
·1830 DATA 208,76,241,192,189,,208,56,249
,249,194,157,,208,176,9,185,197             PI
·1840 DATA 194,77,16,208,141,16,208,185,1
97,194,45,50,195,208,18,173,168,2           EO
·1850 DATA 10,170,232,189,205,194,8,152,1
0,170,232,40,76,18,193,152,10,170           LI
·1860 DATA 232,189,223,194,48,15,240,23,1
85,249,194,24,125,,208,157,,208             FD
·1870 DATA 76,45,193,189,,208,56,249,249,
194,157,,208,96,206,167,2,48                OF
·1880 DATA 3,76,145,192,162,7,142,167,2,1
72,167,2,152,10,170,185,197,194             BH
·1890 DATA 45,42,195,208,3,76,215,193,185
,197,194,45,16,208,208,18,189,.             ND
·1900 DATA 208,56,205,44,195,176,56,173,4
4,195,157,,208,76,117,193,189,.             HI
·1910 DATA 208,56,205,45,195,144,38,173,4
5,195,157,,208,185,197,194,45,43            JG
·1920 DATA 195,240,12,169,255,56,249,197,
194,45,21,208,141,21,208,189,223,194        GA
·1930 DATA 240,7,73,255,9,1,157,223,194,2
32,189,,208,56,205,46,195,176               OC
·1940 DATA 9,173,46,195,157,,208,76,183,1
93,189,,208,56,205,47,195,144               GK
·1950 DATA 38,173,47,195,157,,208,185,197
,194,45,43,195,240,12,169,255,56            PI
·1960 DATA 249,197,194,45,21,208,141,21,2
08,189,223,194,240,7,73,255,9,1             CH
·1970 DATA 157,223,194,206,167,2,48,3,76,
59,193,76,49,234,32,155,183,142             PD
·1980 DATA 44,195,32,155,183,142,45,195,9
6,32,155,183,142,46,195,32,155,183          LH
·1990 DATA 142,47,195,96,32,155,183,142,3
6,195,32,155,183,142,39,195,96,32           LA
·2000 DATA 155,183,142,41,195,32,155,183,
142,38,195,32,155,183,142,40,195,96         ME
·2010 DATA 32,155,183,142,43,195,32,155,1
83,142,42,195,32,155,183,142,50,195         DE
·2020 DATA 96,32,155,183,138,41,7,72,32,1
55,183,104,168,56,224,9,144,2               OO
·2030 DATA 162,,138,153,241,194,152,10,16
8,138,10,170,189,205,194,153,223,194        LE
·2040 DATA 200,232,189,205,194,153,223,19
4,96,32,155,183,138,41,7,72,32,155          PE
·2050 DATA 183,104,168,138,41,15,153,249,
194,96,32,155,183,138,41,7,72,32            JC
·2060 DATA 155,183,104,168,138,153,1,195,
152,72,32,155,183,104,168,138,153,9         PO
·2070 DATA 195,153,17,195,96,32,155,183,1
42,48,195,32,155,183,142,49,195,96          ND
·2080 DATA 32,170,177,152,41,1,170,189,,2
20,41,15,133,253,169,15,56,229              OL
·2090 DATA 253,168,185,25,195,168,169,,10
8,5,,32,155,183,138,72,32,155               ON
·2100 DATA 183,104,168,24,76,240,255,1,2,
4,8,16,32,64,128,,,.                        GL
·2110 DATA 255,1,255,1,,1,1,,1,255,1,255,
,255,255,,,.                                HA
·2120 DATA .,,,,,,,,,,,,,,,,.               BG
·2130 DATA .,,,,,1,1,1,1,1,1,1,1,,,,,.      KE
·2140 DATA .,,,1,1,1,1,1,1,1,1,,,,,,,.      HK
·2150 DATA .,,1,5,,7,8,6,,3,2,4,8,1,1,255
,1,1                                        NE
·2160 DATA 255,,24,65,50,230,255,255,252    HD
·2170 REM SPRITE DATA                       PL
·2180 DATA0,85,,,123,,,106                  DD
·2190 DATA0,,170,,,170,,.                   OG
·2200 DATA245,,3,85,64,13,117,80            FC
·2210 DATA53,85,84,215,119,213,211,85       FJ
·2220 DATA77,211,117,77,211,85,77,211       BA
·2230 DATA117,77,211,85,77,171,117,74       OH
·2240 DATA131,85,98,3,195,192,3,195         IK
·2250 DATA192,3,195,192,15,195,240,.        BB
·2260 DATA0,250,,3,247,128,3,253            PB
·2270 DATA128,3,255,128,3,170,128,15        NP
·2280 DATA170,160,58,255,168,234,255,170    AG
·2290 DATA239,170,186,227,187,142,227,170   PE
·2300 DATA142,87,170,142,83,170,142,23      JH
·2310 DATA170,149,58,174,165,56,3,212       CD
·2320 DATA56,,232,20,,232,84,.              MN
·2330 DATA232,,,212,63,255,213,.            CA
·2340 DATA0,250,,3,247,128,3,253            AI
·2350 DATA128,3,255,128,3,170,128,15        NO
·2360 DATA170,160,58,255,168,234,255,170    CN
·2370 DATA239,170,186,227,187,142,227,170   MP
·2380 DATA142,227,170,149,227,170,133,87    PA
·2390 DATA170,148,90,174,160,22,3,224       FP
·2400 DATA58,,224,58,,80,58,.               OK
·2410 DATA84,21,,,85,255,252,.              CB
·2420 DATA0,,,3,105,128,14,170              EL
·2430 DATA160,14,170,160,15,125,224,13      LD
·2440 DATA215,96,3,170,128,14,170,160       GM
·2450 DATA58,170,168,235,234,186,192,234    OO
·2460 DATA142,240,234,130,195,170,162,243   PE
·2470 DATA163,172,11,163,224,35,128,224     ND
·2480 DATA35,128,224,163,128,224,15,160     HH
·2490 DATA224,12,131,232,63,255,187,.       MN
·2500 DATA0,,,3,105,128,14,170              NL
·2510 DATA160,14,125,160,15,255,224,13      EH
·2520 DATA215,96,3,170,128,14,170,160       JM
·2530 DATA58,170,168,235,234,190,240,234    PD
·2540 DATA130,192,234,142,195,170,162,243   DE
·2550 DATA163,172,11,163,160,11,128,224     NC
·2560 DATA35,128,224,35,128,224,131,131     CH
·2570 DATA232,14,160,200,63,191,255,.       BJ
·2580 DATA0,170,,3,157,128,3,191            JP
·2590 DATA128,3,191,128,3,191,128,15        LP
·2600 DATA190,,15,170,129,15,170,161        CO
·2610 DATA14,170,169,58,170,169,235,234     AG
·2620 DATA173,248,234,174,248,234,174,248   IP
·2630 DATA255,234,32,234,136,,234,128       OL
·2640 DATA3,234,160,3,170,160,15,170        EJ
·2650 DATA168,14,170,168,254,170,171,14     OP
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•2660 DATA0,,,,170,,3,157                        NG
•2670 DATA128,3,191,128,3,191,128,3             AD
•2680 DATA191,128,15,190,,15,170,129            IA
•2690 DATA15,170,161,14,170,169,58,170          OH
•2700 DATA169,235,234,173,248,234,174,248       KH
•2710 DATA234,174,248,255,234,32,234,136        GC
•2720 DATA0,234,128,3,234,160,3,170             NN
•2730 DATA160,15,170,168,254,170,171,255,
 .                                               OF
•2740 REM SUBWAY PLATFORM COLORS                 KL
•2750 DATA 11,4,9,6                              NE
•2760 REM CONTROL ARROWS                         EK
•2770 DATA"[RVSON][sEP][DOWN][LEFT][LEFT]
 [sEP][4" "][DOWN][5"[LEFT]"][RVSOFF][c *
 ][RVSON][4" "][DOWN][4"[LEFT]"][RVSOFF][
 c *]","[RVSON][c *][DOWN][4"[LEFT]"][4"
 "][c *][DOWN][5"[LEFT]"][4" "][RVSOFF][s
 EP][DOWN][LEFT][LEFT][sEP]"                     PO
•2780 REM TIME CROSSROADS                        IK
•2790 DATA0,JESUS OF NAZARETH,60,ALEXANDR
 IAN STEAM ENGINE,79,VESUVIUS ERUPTS             OJ
•2800 DATA143,PTOLEMY'S EGOCENTRIC SOLAR
 SYSTEM,400,VISIGOTHS OVERRUN ROME               DP
•2810 DATA450,ALEXANDRIA LIBRARY BURNS,47
 6,DARK AGES BEGIN,540,BIRTH OF MUHAMMED         IB
•2820 DATA700,PUEBLO INDIANS,770,AGE OF C
 HARLEMAGNE,1000,LEIF ERICCSON'S VOYAGE          LP
•2830 DATA1066,WILLIAM THE CONQUERER,1067
 ,BAYEAUX TAPESTRY                               ME
•2840 DATA1200,CRUSADERS SACK CONSTANTINO
 PLE,1215,MAGNA CARTA                            GI
•2850 DATA1348,BLACK PLAGUE OF EUROPE,145
 4,GUTENBERG'S PRINTING PRESS                    LK
•2860 DATA1495,RENAISSANCE BEGINS,1512,MI
 CHELANGELO PAINTS SISTINE CHAPEL                HG
•2870 DATA1519,CORTES & MONTEZUMA,1580,DR
 AKE CIRCLES GLOBE,1620,MAYFLOWER SAILS          GM
•2880 DATA1685,NEWTON'S LAW,1691,SALEM WI
 TCH HUNT,1752,BEN FRANKLIN'S KITE               JH
•2890 DATA1776,AMERICAN REVOLUTION,1793,C
 OTTON GIN,1803,MONROE DOCTRINE,1861             NA
•2900 DATACIVIL WAR,1912,TITANTIC SINKS,1
 914,WORLD WAR I,1930,GREAT DEPRESSION           ML
•2910 DATA1937,HINDENBURG DISASTER,1939,W
 ORLD WAR II,1945,HIROSHIMA                      LP
•2920 DATA1948,TRANSISTOR PATENTED,1954,B
 ANNISTER'S 4 MINUTE MILE,1961                   LF
•2930 DATACUBAN MISSILE CRISIS,1969,MOON
 WALK,1973,WATERGATE,1976                        PI
•2940 DATAMAO TSETUNG'S DEATH,1978,TEST T
 UBE BABY,1982,COMMODORE 64 RELEASED             OM
•2950 DATA1984,AHOY MAGAZINE CREATED,1988
 ,US/USSR ARMS TREATY                            EG
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HI-RES WINDOWS
FROM PAGE 18

MAIN PROGRAM

```
•10 REM *** HI-RES WINDOWS ***                   HB
•20 REM ***  FOR THE C-128 ***                   IC
•30 REM ***       BY       ***                   EI
•40 REM ***  DENNIS FURMAN ***                   AG
•50 REM                                          MD
•60 S=2816:PRINTCHR$(147)"POKING DATA[3".
 "]"                                             IH
•70 FORX=STOS+229:READA:C=C+A:POKEX,A:NEX
 T                                               CH
•80 IF C=25462 THEN 110                          PJ
•90 PRINT"[CLEAR][DOWN]ERROR IN DATA STAT
 EMENTS[3"."]"                                   HF
•100 PRINT"CHECK ENTRIES":END                    HL
•110 PRINT"[CLEAR][DOWN]ENTER THE COLUMN
 & ROW OF THE UPPER"                             KH
•120 INPUT"LEFT CORNER OF THE WINDOW";C,R        AI
•130 PRINT:INPUT"ENTER THE WIDTH OF THE W
 INDOW";W:W=W*8                                  GD
•140 PRINT:INPUT"ENTER THE NUMBER OF ROWS
 ";NR                                            LO
•150 CELL=8192+(R-1)*320+(C-1)*8                 IL
•160 HI=INT(CELL/256):LO=CELL-256*HI             JJ
•170 POKE 2819,LO:POKE 2824,HI                   AK
•180 POKE 2876,LO:POKE 2881,HI                   EG
•190 POKE 2966,LO:POKE 2971,HI                   HO
•200 POKE 2837,W:POKE 2842,NR                    AC
•210 POKE 2905,W:POKE 2924,W:POKE 2910,NR        KJ
•220 POKE 2995,W:POKE 3014,W:POKE 3000,NR        LE
•230 BSAVE"WINDOW.OBJ",B0,P2816 TO P3047         AE
•240 END                                         HA
•250 DATA 162,000,169,216,141,017,011,169        IC
•260 DATA 040,141,018,011,169,000,160,000        HD
•270 DATA 153,152,059,200,192,160,208,248        JP
•280 DATA 232,224,016,208,001,096,024,173        DC
•290 DATA 017,011,105,064,141,017,011,173        IM
•300 DATA 018,011,105,001,141,018,011,184        LH
•310 DATA 080,218,133,171,169,063,141,000        AJ
•320 DATA 255,162,000,169,216,141,082,011        PD
•330 DATA 169,040,141,083,011,165,171,141        NL
•340 DATA 086,011,169,000,141,085,011,160        PL
•350 DATA 000,185,152,059,153,096,181,200        FD
•360 DATA 192,160,208,245,232,224,016,208        BF
•370 DATA 006,169,000,141,000,255,096,024        LO
•380 DATA 173,085,011,105,160,141,085,011        CF
•390 DATA 173,086,011,105,000,141,086,011        BG
•400 DATA 024,173,082,011,105,064,141,082        AO
•410 DATA 011,173,083,011,105,001,141,083        NP
•420 DATA 011,184,080,195,133,171,169,063        JM
•430 DATA 141,000,255,162,000,169,216,141        PF
•440 DATA 175,011,169,040,141,176,011,165        HC
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•450 DATA 171,141,173,011,169,000,141,172 CD
•460 DATA 011,160,000,185,096,181,153,152 FK
•470 DATA 059,200,192,160,208,245,232,224 GI
•480 DATA 016,208,006,169,000,141,000,255 KA
•490 DATA 096,024,173,172,011,105,160,141 FG
•500 DATA 172,011,173,173,011,105,000,141 FL
•510 DATA 173,011,024,173,175,011,105,064 OC
•520 DATA 141,175,011,173,176,011,105,001 BD
•530 DATA 141,176,011,184,080,195         IM
```

DEMO

```
•100 DIM CY(16)                           EH
•110 COLOR0,2:COLOR1,15:COLOR4,2          HD
•120 GRAPHIC1,1                           OF
•130 BLOAD"WINDOW.OBJ",B0,P2816           GM
•140 FORI=0TO15:READCY(I):NEXTI           EC
•150 :                                    NA
•160 :     REM DRAW ANIMATION SEQUENCE    FN
•170 T=0                                  NN
•180 FORJ=0TO7                            DE
•190 : CIRCLE1,160,CY(T),20,15            II
•200 : FORI=18TO3STEP-5                   GC
•210 : CIRCLE1,160,CY(T),I,15             MC
•220 NEXTI                                KB
•230 PAINT1,141+J*5,CY(T)                 PD
•240 SYS 2866,100+4*J                     NN
•250 T=T+1:GRAPHIC1,1                     MB
•260 FORI=20TO0STEP-5                     EA
•270 : CIRCLE1,160,CY(T),I,15             GH
•280 NEXTI                                OG
•290 PAINT1,141+J*5,CY(T)                 EG
•300 SYS 2866,102+4*J                     BM
•310 T=T+1:GRAPHIC1,1                     AK
•320 NEXTJ                                AN
•330 :                                    IF
•340 :          REM DRAW SCENE            KH
•350 COLOR1,10                            AA
•360 BOX,127,71,192,120                   DA
•370 BOX,122,69,196,123                   GL
•380 BOX,119,67,199,125                   BG
•390 DRAW,120,65TO198,65TO193,61TO125,61T
 O120,65:PAINT,160,63                     FL
•400 PAINT,120,68                         LM
•410 DRAW,125,126TO128,140TO 132,140TO135
 ,126                                     HE
•420 DRAW,193,126TO190,140TO 186,140TO183
 ,126                                     DC
•430 PAINT,130,135:PAINT,187,135          KG
•440 DRAW,118,118TO20,118TO0,140:DRAW,20,
 118TO20,0                                PP
•450 DRAW,200,118TO309,118TO319,140:DRAW,
 309,118TO309,0                           MH
•451 FORL=0TO5:FORW=0TO7:POKE7544+L*40+W,
 048:NEXTW,L                              AJ
•460 :                                    AH
•470 :            REM ANIMATE!            LK
•480 FORI=100TO130STEP 2:SYS2956,I:FORT=0
 TO50:NEXTT,I                             JD
•490 GETA$:IFA$=""THEN480                 EA
•500 SYS 2816:END                         CH
•510 DATA 68,69,72,77,84,93,104,117,104,9
 3,84,77,72,69,68,68                      AC
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SPRITE EXPLODER
FROM PAGE 22

```
•1 FORX=0TO455:READA:POKE49176+X,A:NEXT:F
 ORX=0TO455:READA:POKE49680+X,A:NEXT      DL
•2 POKE52,48:POKE56,48:CLR:S1=255:DS=-1:S
 2=S1+DS:P1=49152                         PH
•10 PRINT"[CLEAR][WHITE]JOHN FEDOR'S SPRI
 TE EXPLODER!":POKE53269,0                JK
•15 POKE53280,0:POKE53281,0               EC
•20 PRINT"[DOWN][DOWN][s U][s C][c S][DOW
 N][3"[LEFT]"][s B]1[s B]  LOAD SPRITES"C
 HR$(13)"[c Z][s C][s K]"                 CG
•30 PRINT"[DOWN][DOWN][s U][s C][c S][DOW
 N][3"[LEFT]"][s B]2[s B]  SAVE SPRITES"C
 HR$(13)"[c Z][s C][s K]"                 LE
•40 PRINT"[DOWN][DOWN][s U][s C][c S][DOW
 N][3"[LEFT]"][s B]3[s B]  EXPLODE SPRITE
 S"CHR$(13)"[c Z][s C][s K]"              LI
•50 PRINT"[DOWN][DOWN][s U][s C][c S][DOW
 N][3"[LEFT]"][s B]4[s B]  ANIMATE SPRITE
 S"CHR$(13)"[c Z][s C][s K]"              GP
•60 PRINTTAB(12)"[3"[DOWN]"]CHOICE (1-4)
 ? ";                                     ND
•65 POKE198,0                             NK
•70 GETA$:IFA$<"1"ORA$>"4"THEN70          AO
•75 ONVAL(A$)GOSUB300,400,100,500         AH
•80 GOTO10                                DL
•100 PRINT"[CLEAR]":V=53248:POKEV,104:POK
 EV+1,100:POKEV+3,100:POKEV+2,152         DN
•110 POKEV+21,1:POKEV+39,1:POKEV+40,1     CO
•120 POKE2040,S1:POKE2041,S2              OE
•125 PRINT"CHOOSE SOURCE SPRITE (+/-)."   NL
•130 PRINT"HIT <RETURN> WHEN READY."      MI
•135 POKE198,0                            CI
•140 POKE2040,S1:PRINT"[HOME][5"[DOWN]"]"
 TAB(9)S1:GETA$:IFA$="+"THENS1=S1+1       BL
•143 IFS1>255THENS1=255                   HK
•145 IFA$="-"THENS1=S1-1:IFS1<192THENS1=1
 92                                       GK
•150 IFA$<>CHR$(13)THEN140                LK
•155 S2=S1+DS:POKE2041,S2:POKEV+21,3      KJ
•160 PRINT"[CLEAR][DOWN]CHOOSE DESTINATIO
 N SPRITE (+/-).":PRINT"HIT <RETURN> WHEN
  READY."                                 FK
•165 POKE198,0                            DO
•170 PRINT"[HOME][5"[DOWN]"]"TAB(15)S2    LH
•173 S3=0:GETA$:IFA$="+"ORA$="-"THENS3=VA
 L(A$+"1"):IFS3+S1<128ORS3+S1>255THEN170  KO
•175 IFS3THENDS=S3:S2=S1+DS:POKE2041,S2:G
```

```
OTO170                                      GN
·180 IFA$<>CHR$(13)THEN170                  KN
·181 PRINT"[CLEAR][DOWN]HOW MANY FRAMES D
O YOU WANT (1-12) ?":INPUTMX:IFMX<1ORMX>
12THEN181                                   GK
·182 IFMX*DS+S1<192THENMX=S1-192            LE
·183 IFMX*DS+S1>255THENMX=255-S1            FJ
·184 FORQ=1TOMX:POKE2040,S1:POKE2041,S2:P
RINT"[CLEAR][DOWN]CALCULATING. "1+MX-Q"L
EFT TO DO"                                  AB
·185 FORI=S2*64TOS2*64+63:POKEI,.:NEXT:FO
RX=1TO22:X4=INT(X/8):FORY=1TO19             BK
·190 IFPEEK(S1*64+Y*3+X4)AND(2[UPARROW]((
23-X)AND7))THENGOSUB200                     OL
·195 NEXTY,X:S1=S2:S2=S2+DS:NEXTQ:RETURN    CA
·200 P=X+Y*24:X1=PEEK(P+P1):Y1=PEEK(P+P1+
504):A=S2*64+Y1*3+INT(X1/8)                 JD
·202 IFP=600THENRETURN                      CH
·205 POKEA,PEEK(A)OR(2[UPARROW]((23-X1)AN
D7)):RETURN                                 OP
·300 PRINT"[CLEAR]LOAD:"                    PN
·305 PRINT"[DOWN]ENTER THE FILENAME TO BE
 LOADED":F$="":C$=CHR$(0)                   GC
·310 INPUTF$:IFF$=""THENRETURN              HL
·313 PRINT"[CLEAR]LOADING[3"."]"            CG
·315 OPEN15,8,15,"I0":OPEN5,8,5,F$+",P,R"
:INPUT#15,A,B$,C,D:IFATHEN600               GA
·320 GET#5,A$,B$:S1=(ASC(A$+C$)+ASC(B$+C$
)*256)/64:S2=S1                             PM
·325 GET#5,A$:IFSTTHEN340                   JC
·330 POKES2*64,ASC(A$+C$):FORI=1TO63:GET#
5,A$:POKES2*64+I,ASC(A$+C$):NEXTI           LE
·335 S2=S2+1:GOTO325                        EJ
·340 S2=S2-1:CLOSE5:CLOSE15                 DO
·345 RETURN                                 OI
·400 PRINT"[CLEAR]SAVE:"                    GK
·405 PRINT"[DOWN]ENTER THE FILENAME TO BE
 SAVED":F$="":C$=CHR$(0)                    FH
·410 INPUTF$:IFF$=""THENRETURN              NH
·415 V=53248:POKEV+21,1:POKEV,100:POKEV+1
,100:POKEV+39,1:POKE2040,S1:POKE198,0       IH
·420 PRINT"[CLEAR]CHOOSE STARTING SPRITE
FRAME TO SAVE.":PRINT"USE +/-, <RETURN>"    GH
·425 PRINT"[HOME][5"[DOWN]"]"TAB(9)S1:POK
E2040,S1                                    AE
·430 GETA$:IFA$="+"THENS1=S1+1:IFS1=256TH
ENS1=255                                    JP
·435 IFA$="-"THENS1=S1-1:IFS1=191THENS1=1
92                                          BD
·440 IFA$<>CHR$(13)THEN425                  MN
·441 POKE198,0                              EH
·443 PRINT"[CLEAR]CHOOSE ENDING SPRITE FR
AME TO SAVE.":PRINT"USE +/-, <RETURN>":S
2=S1                                        FG
·445 PRINT"[HOME][5"[DOWN]"]"TAB(9)S2:POK
E2040,S2                                    FI
·447 GETA$:IFA$="+"THENS2=S2+1:IFS2=256TH
ENS2=255                                    FC
·449 IFA$="-"THENS2=S2-1:IFS2<S1THENS2=S1   BO
·450 IFA$<>CHR$(13)THEN445                  KJ
·455 OPEN15,8,15,"I0":OPEN5,8,5,F$+",P,W"
:INPUT#15,A,B$,C,D:IFATHEN600               LD
·457 PRINT"[CLEAR]SAVING[3"."]"             IG
·460 A=S1*64:H=INT(A/256):L=A-H*256:PRINT
#5,CHR$(L)CHR$(H);                          IO
·465 FORI=ATOS2*64+63:PRINT#5,CHR$(PEEK(I
));:NEXTI                                   MJ
·470 CLOSE5:CLOSE15:RETURN                  KB
·500 PRINT"[CLEAR]ANIMATION SEQUENCE."      PH
·505 V=53248:POKEV,100:POKEV+1,100          HK
·507 PRINT"CHOOSE BEGINNING FRAME: (+/-).
":POKE198,0                                 EA
·510 POKEV+39,1:POKEV+21,1                  AF
·515 PRINT"[HOME][5"[DOWN]"]"TAB(9)S1:POK
E2040,S1                                    JF
·520 GETA$:IFA$="+"THENS1=S1+1:IFS1=256TH
ENS1=255                                    GG
·525 IFA$="-"THENS1=S1-1:IFS1=191THENS1=1
92                                          AK
·530 IFA$<>CHR$(13)THEN515                  DO
·535 PRINT"[HOME][DOWN]CHOOSE ENDING FRAM
E: (+/-).[3" "]":POKE198,0                  NE
·540 PRINT"[HOME][5"[DOWN]"]"TAB(9)S2:POK
E2040,S2                                    LI
·545 GETA$:IFA$="+"THENS2=S2+1:IFS2=256TH
ENS2=255                                    PF
·550 IFA$="-"THENS2=S2-1:IFS2=191THENS2=1
92                                          LB
·555 IFA$<>CHR$(13)THEN540                  AJ
·560 DX=10:POKE198,0                        MF
·565 PRINT"[CLEAR]ANIMATION SEQUENCE"       GK
·570 PRINT"USE (+/-) TO ADJUST DELAY":PRI
NT"DELAY="                                  NM
·575 FORX=S1TOS2STEPSGN(S2-S1):PRINT"[HOM
E][DOWN][DOWN]"TAB(8)DX"[LEFT] "            DE
·580 POKE2040,X:GETA$:IFA$="-"THENDX=DX+1   IB
·585 IFA$="+"THENDX=DX-1:IFDX<1THENDX=1     GE
·590 FORI=1TODX:NEXTI:NEXTX                 JE
·595 PRINT"[DOWN]AGAIN (Y/N) ?":POKE198,0   PB
·597 GETA$:IFA$="Y"THEN565                  PM
·598 IFA$<>"N"THEN597                       IL
·599 RETURN                                 OH
·600 CLOSE5:CLOSE15                         GJ
·605 PRINT"[CLEAR]THERE WAS A DISK ERROR!
"                                           BM
·610 PRINT"[DOWN]PLEASE FIX AND CORRECT."   LJ
·615 PRINT"[DOWN]"A","B$","C","D            LP
·620 IFA=63THEN650                          HD
·625 PRINT"[DOWN]PRESS <RETURN> FOR MENU.
"                                           KB
·630 GETA$:IFA$<>CHR$(13)THEN630            AC
·635 RETURN                                 AL
·650 PRINT"[DOWN]WOULD YOU LIKE TO SCRATC
H "F$"?"                                    HC
·655 POKE198,0                              CK
·660 GETA$:IFA$="N"THEN625                  FH
```

```
·665 IFA$<>"Y"THEN660                         LI
·670 OPEN15,8,15,"S0:"+F$:CLOSE15             CG
·675 GOTO455                                  MF
·49176 DATA24,0,1,3,4,5,6,7                   JH
·49184 DATA8,9,10,11,13,14,15,16              GL
·49192 DATA17,18,19,20,21,22,23,24            CL
·49200 DATA24,0,1,2,3,4,5,6                   DI
·49208 DATA8,9,10,11,12,13,14,15              KL
·49216 DATA17,18,19,20,21,22,23,24            FD
·49224 DATA24,0,1,2,3,4,5,7                   LD
·49232 DATA8,9,10,11,12,13,15,16              BH
·49240 DATA17,18,19,20,21,22,23,24            LL
·49248 DATA24,0,1,2,3,4,5,7                   KL
·49256 DATA7,9,10,11,12,14,14,16              KI
·49264 DATA17,18,19,20,21,22,23,24            KD
·49272 DATA24,0,1,2,3,4,5,6                   KA
·49280 DATA7,9,10,11,12,13,15,16              JI
·49288 DATA17,18,19,20,21,22,23,24            IL
·49296 DATA24,0,1,2,3,4,5,6                   JI
·49304 DATA7,9,10,11,13,14,15,16              EA
·49312 DATA17,18,19,20,21,22,23,24            LD
·49320 DATA24,0,1,2,3,4,5,6                   BA
·49328 DATA7,8,10,11,13,14,15,16              BL
·49336 DATA17,18,19,20,21,22,23,24            BL
·49344 DATA24,0,1,2,3,4,5,6                   AI
·49352 DATA7,8,9,11,13,14,15,16               HJ
·49360 DATA17,18,19,20,21,22,23,24            AD
·49368 DATA24,0,1,2,3,4,5,6                   AA
·49376 DATA7,8,9,10,13,14,15,16               MK
·49384 DATA17,18,19,20,21,22,23,24            OL
·49392 DATA24,0,1,2,3,4,5,6                   PI
·49400 DATA7,8,9,10,13,14,15,16               OC
·49408 DATA17,18,19,20,21,22,23,24            EK
·49416 DATA24,0,1,2,3,4,5,6                   GF
·49424 DATA7,8,9,11,13,14,15,16               LG
·49432 DATA17,18,19,20,21,22,23,24            FC
·49440 DATA24,0,1,2,3,4,5,6                   DN
·49448 DATA7,8,10,11,13,14,15,16              IM
·49456 DATA17,18,19,20,21,22,23,24            BK
·49464 DATA24,0,1,2,3,4,5,6                   JF
·49472 DATA7,9,10,11,13,14,15,16              GJ
·49480 DATA17,18,19,20,21,22,23,24            KC
·49488 DATA24,0,1,2,3,4,5,6                   KN
·49496 DATA8,9,10,11,13,14,15,16              FM
·49504 DATA17,18,19,20,21,22,23,24            KK
·49512 DATA24,0,1,2,3,4,5,6                   MF
·49520 DATA7,9,10,11,12,13,15,16              AF
·49528 DATA17,18,19,20,21,22,23,24            LC
·49536 DATA24,0,1,2,3,4,5,7                   JM
·49544 DATA7,9,10,11,12,14,14,16              DF
·49552 DATA17,18,19,20,21,22,23,24            HK
·49560 DATA24,0,1,2,3,4,5,7                   PE
·49568 DATA8,9,10,11,12,13,15,16              FE
·49576 DATA17,18,19,20,21,22,23,24            AC
·49584 DATA24,0,1,2,3,4,5,6                   AN
·49592 DATA8,9,10,11,12,13,14,15              KA
·49600 DATA17,18,19,20,21,22,23,24            AK
·49608 DATA24,0,1,3,4,5,6,7                   CI
·49616 DATA8,9,10,11,13,14,15,16              GE
·49624 DATA17,18,19,20,21,22,23,24            BC
·49680 DATA24,1,0,0,0,0,0,0                   DM
·49688 DATA0,0,0,0,0,0,0,0                    CA
·49696 DATA0,0,0,0,0,0,1,24                   HA
·49704 DATA24,2,1,1,1,1,1,1                   GD
·49712 DATA1,1,1,1,1,1,1,1                    BI
·49720 DATA1,1,1,1,1,1,2,24                   IH
·49728 DATA24,3,2,2,2,2,2,2                   HK
·49736 DATA2,2,2,2,2,2,2,2                    DA
·49744 DATA2,2,2,2,2,2,3,24                   FO
·49752 DATA24,4,3,4,4,4,3,3                   LM
·49760 DATA3,3,3,3,3,3,3,3                    GI
·49768 DATA3,3,3,4,4,3,4,24                   HN
·49776 DATA24,5,5,5,4,5,5,5                   JP
·49784 DATA4,4,4,4,4,4,4,4                    EA
·49792 DATA4,5,4,4,5,5,5,24                   PF
·49800 DATA24,6,6,5,6,6,5,5                   NI
·49808 DATA5,5,5,5,5,5,5,5                    JI
·49816 DATA5,6,6,6,5,6,6,24                   NN
·49824 DATA24,7,7,7,7,7,7,7                   PG
·49832 DATA7,7,6,6,6,6,6,7                    JH
·49840 DATA7,7,7,7,7,7,7,24                   NK
·49848 DATA24,8,8,8,8,8,8,8                   NN
·49856 DATA8,8,8,7,7,7,8,8                    AJ
·49864 DATA8,8,8,8,8,8,8,24                   FB
·49872 DATA24,9,9,9,9,9,9,9                   FE
·49880 DATA9,9,9,9,10,9,9,9                   OB
·49888 DATA9,9,9,9,9,9,9,24                   GI
·49896 DATA24,11,10,10,10,10,11,10            AP
·49904 DATA10,11,11,11,10,11,11,11            JK
·49912 DATA10,11,10,10,10,10,11,24            AB
·49920 DATA24,12,11,11,11,12,11,12            PK
·49928 DATA12,12,12,12,12,12,12,12            EL
·49936 DATA12,12,11,12,11,11,12,24            DL
·49944 DATA24,13,12,12,13,13,12,13            JC
·49952 DATA13,13,13,13,13,13,13,13            EL
·49960 DATA13,13,13,12,13,12,13,24            EF
·49968 DATA24,14,13,14,13,14,14,14            FM
·49976 DATA14,14,14,14,14,14,14,14            ED
·49984 DATA14,14,14,14,14,13,14,24            CB
·49992 DATA24,15,14,15,15,15,15,14            OF
·50000 DATA15,15,15,15,15,15,15,15            FL
·50008 DATA15,15,15,15,14,15,15,24            IM
·50016 DATA24,16,16,15,16,16,16,16            KD
·50024 DATA16,16,16,16,16,16,16,16            GL
·50032 DATA16,16,16,16,16,16,16,24            LM
·50040 DATA24,17,17,17,17,17,17,17            PP
·50048 DATA17,17,17,17,17,17,17,17            PL
·50056 DATA17,17,17,17,17,17,17,24            KN
·50064 DATA24,18,18,18,18,18,18,18            II
·50072 DATA18,18,18,18,18,18,18,18            ID
·50080 DATA18,18,18,18,18,18,18,24            LG
·50088 DATA24,19,19,19,19,19,19,19            NB
·50096 DATA19,19,19,19,19,19,19,19            HL
·50104 DATA19,19,19,19,19,19,19,24            LP
·50112 DATA24,20,20,20,20,20,20,20            JH
·50120 DATA20,20,20,20,20,20,20,20            PL
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•50128 DATA20,20,20,20,20,20,20,24     NH
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BARRICADE
FROM PAGE 16

Starting address in hex: C000
Ending address in hex: C74B
SYS to start: 49152

***Flankspeed* required for entry! See page 69.**

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C000: A9 00 8D 20 D0 8D 21 D0 A7
C008: A9 08 20 D2 FF 20 AF C4 41
C010: A0 18 B9 DD C5 99 00 D4 94
C018: 88 10 F7 20 9A C3 20 BD 05
C020: C2 A2 15 A0 0F 18 20 F0 73
C028: FF A9 F6 A0 C5 20 1E AB 19
C030: A9 01 8D FF C4 A9 04 8D 68
C038: 00 C5 A0 15 A9 00 99 06 FC
C040: C5 88 10 FA A9 64 8D 1B 50
C048: C5 20 5E C3 AD FF C4 20 E2
C050: 6E C3 8E BB 07 8C BC 07 24
C058: 8D BD 07 20 FB C3 AD 8D C5
C060: 02 D0 FB E6 04 D0 08 AD A0
C068: 1B C5 F0 03 20 5B C3 A5 22
C070: 04 29 0F D0 03 20 63 C1 C5
C078: AD 1A C5 F0 06 CE 1A C5 AB
C080: 4C AC C0 38 A9 15 ED FF 1F
C088: C4 0A 0A 0A 8D 1A C5 A9 82
C090: 00 8D 19 C5 20 08 C2 AD 95
C098: 19 C5 C5 FE F0 27 A9 1E 1C
C0A0: 8D 08 D4 A2 10 8E 0B D4 2C
C0A8: E8 8E 0B D4 A2 04 20 89 50
C0B0: C3 AE 06 C5 AC 0F C5 20 90
C0B8: 3A C3 A0 00 B1 3B C9 88 96
C0C0: D0 9C 4C 0C C1 A5 FE 85 72
C0C8: 05 A6 05 BC 0F C5 BD 06 CE
C0D0: C5 AA 20 3A C3 A9 20 A0 C9
C0D8: 00 91 3B A0 02 20 D4 C2 FF
C0E0: A9 1E 20 92 C3 C6 05 D0 BB
C0E8: E0 AD 1B C5 F0 10 20 5B D4
C0F0: C3 A0 04 20 D4 C2 A9 02 BC
C0F8: 20 92 C3 4C E9 C0 AC FF 13
C100: C4 C8 C0 15 B0 03 8C FF A3
C108: C4 4C 3A C0 A9 00 85 05 48
C110: A2 40 8E 04 D4 E8 8E 04 D5
C118: D4 A5 05 29 1F 8D 01 D4 43
C120: A2 06 20 89 C3 E6 05 D0 F2
C128: F0 CE 00 C5 AD 00 C5 AA CB
C130: 0A 18 6D 00 C5 A8 A9 20 F7
C138: 99 57 07 8A D0 CB A2 15 0F
C140: A0 08 18 20 F0 FF EE 86 87
C148: 02 A0 00 B9 35 C6 F0 EE 80
C150: 20 D2 FF A9 02 20 92 C3 65
C158: C8 AD 00 DC 29 10 D0 EB A1
C160: 4C 1B C0 AD 00 DC 29 0F 4B
C168: A0 07 D9 82 C5 F0 10 88 BB
C170: 10 F8 A9 08 85 FD AE 06 63
C178: C5 AC 0F C5 4C EF C1 84 42
C180: FD A9 00 8D 18 C5 AD 0F 50
C188: C5 85 FC AD 06 C5 85 FB CB
C190: A6 FD 18 A5 FC 7D 7A C5 AD
C198: 85 FC A8 18 A5 FB 7D 72 6D
C1A0: C5 85 FB AA 20 3A C3 A0 51
C1A8: 00 B1 3B C9 20 F0 0A C9 44
C1B0: 89 D0 BF EE 18 C5 4C 90 74
C1B8: C1 AD 18 C5 F0 0A A0 00 A1
C1C0: A9 89 91 3B A9 06 91 A7 A9
C1C8: AE 06 C5 AC 0F C5 20 3A 1F
C1D0: C3 A0 00 A9 20 91 3B A6 72
C1D8: FD 18 AD 0F C5 7D 7A C5 2F
C1E0: 8D 0F C5 A8 18 AD 06 C5 7D
C1E8: 7D 72 C5 8D 06 C5 AA 20 C2
C1F0: 3A C3 A6 FD A5 04 4A 4A D1
C1F8: 4A 4A 29 01 1D 8A C5 A0 C5
C200: 00 91 3B A9 01 91 A7 60 11
C208: A5 FE 85 05 A6 05 A9 0F 9B
C210: BC 06 C5 CC 06 C5 F0 09 2B
C218: A9 0D CC 06 C5 90 02 A9 A3
C220: 0E BC 0F C5 CC 0F C5 F0 52
C228: 09 90 05 29 0B 4C 32 C2 3C
C230: 29 07 A0 07 D9 82 C5 F0 1B
C238: 03 88 D0 F8 98 0A 0A 0A 44
C240: 85 FD A9 08 85 06 A4 FD A3
C248: B9 9D C5 A8 20 5F C2 90 E0
C250: 09 E6 FD C6 06 D0 EF EE BA
C258: 19 C5 C6 05 D0 AE 60 A6 89
C260: 05 18 BD 06 C5 79 72 C5 B8
C268: 85 FB 18 BD 0F C5 79 7A 88
C270: C5 85 FC A8 A6 FB 20 3A 5E
C278: C3 A0 00 B1 3B C9 20 F0 A4
C280: 0A C9 80 90 04 C9 88 90 4C
C288: 02 38 60 A6 05 BC 0F C5 60
C290: BD 06 C5 AA 20 3A C3 A0 83
C298: 00 A9 20 91 3B A6 05 A5 80
C2A0: FC 9D 0F C5 A8 A5 FB 9D F7
C2A8: 06 C5 AA 20 3A C3 A9 88 6F
C2B0: A0 00 91 3B A6 05 BD 37 BE
C2B8: C5 91 A7 18 60 A0 04 A9 7E
C2C0: 00 99 01 C5 88 10 FA A0 55
C2C8: 5D A9 07 99 7D DB 88 10 62
C2D0: FA 4C F4 C2 38 B9 01 C5 88
C2D8: 69 00 C9 0A 90 02 A9 00 52
C2E0: 99 01 C5 88 10 EF A9 32 A5
C2E8: 8D 08 D4 A2 10 8E 0B D4 74
C2F0: E8 8E 0B D4 A9 7D 85 3B 30
C2F8: A9 07 85 3C A9 00 85 02 9C
C300: A4 02 B9 01 C5 0A 18 79 C2
C308: 01 C5 0A AA A9 00 85 03 B5
C310: A4 03 B9 97 C5 A8 BD C0 F5
C318: C6 91 3B E8 E6 03 A5 03 27
C320: C9 06 90 EC 18 A5 3B 69 CF
C328: 03 85 3B A5 3C 69 00 85 BC
C330: 3C E6 02 A5 02 C9 05 90 5C
C338: C7 60 BD 40 C5 85 3B BD A2
C340: 59 C5 09 04 85 3C 18 98 DE
C348: 65 3B 85 3B 85 A7 A5 3C B8
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C350: 69 00 85 3C 29 03 09 D8 89
C358: 85 A8 60 CE 1B C5 AD 1B 5F
C360: C5 20 6E C3 8E A0 07 8C 3B
C368: A1 07 8D A2 07 60 A2 30 7B
C370: A0 30 C9 64 90 06 E9 64 54
C378: E8 4C 72 C3 C9 0A 90 06 4E
C380: E9 0A C8 4C 7C C3 09 30 03
C388: 60 A0 00 C8 D0 FD CA D0 BC
C390: FA 60 18 65 A2 C5 A2 D0 45
C398: FC 60 A9 93 20 D2 FF A2 C8
C3A0: 06 A0 0B 18 20 F0 FF A9 25
C3A8: 4E A0 C6 20 1E AB A9 00 F1
C3B0: 85 FE A9 7D 20 92 C3 A2 75
C3B8: 0A A0 03 18 20 F0 FF A9 39
C3C0: 9C A0 C6 20 1E AB AD 00 5C
C3C8: DC 29 0C 4A 4A A8 18 A5 D5
C3D0: FE 79 93 C5 C9 05 B0 02 24
C3D8: 85 FE A5 FE 0A A8 A9 01 5F
C3E0: 99 AB D9 A9 05 20 92 C3 25
C3E8: AD 00 DC 29 10 D0 C8 18 5E
C3F0: A5 FE 69 04 85 FE A9 93 C4
C3F8: 4C D2 FF A9 28 85 3B 85 30
C400: A7 A9 04 85 3C A9 D8 85 1F
C408: A8 A2 13 A9 A0 A0 27 91 0A
C410: 3B A9 20 88 91 3B 88 D0 C3
C418: FB A9 A0 91 3B A9 0B 91 71
C420: A7 A0 27 91 A7 C8 20 46 F7
C428: C3 CA D0 DF A0 27 A9 F7 D0
C430: 99 00 04 A9 EF 99 20 07 28
C438: A9 0B 99 00 D8 99 20 DB F4
C440: 88 10 EB A9 52 85 3B 85 07
C448: A7 A9 04 85 3C A9 D8 85 67
C450: A8 A9 11 85 05 A5 05 29 12
C458: 01 A8 A9 89 91 3B A9 06 B1
C460: 91 A7 C8 C8 C0 24 90 F2 93
C468: A0 28 20 46 C3 C6 05 D0 F7
C470: E4 A5 FE 85 05 A4 05 B9 E7
C478: 1C C5 99 06 C5 AA B9 25 49
C480: C5 99 0F C5 A8 20 3A C3 7B
C488: A4 05 BE 37 C5 B9 2E C5 9B
C490: A0 00 91 3B 8A 91 A7 A9 6B
C498: 50 8D 08 D4 A2 10 8E 0B 9F
C4A0: D4 E8 8E 0B D4 A9 1E 20 B4
C4A8: 92 C3 C6 05 10 C7 60 AD B0
C4B0: 0E DC 29 FE 8D 0E DC A5 E1
C4B8: 01 29 FB 85 01 A9 D0 85 65
C4C0: 3A A9 38 85 3C A0 00 84 C3
C4C8: 39 84 3B A2 08 B1 39 91 E8
C4D0: 3B C8 D0 F9 E6 3A E6 3C E3
C4D8: CA D0 F2 A5 01 09 04 85 A0
C4E0: 01 AD 0E DC 09 01 8D 0E 20
C4E8: DC AD 18 D0 29 F0 09 0E 8D
C4F0: 8D 18 D0 A0 4F B9 FC C6 D4
C4F8: 99 00 3C 88 10 F7 60 00 BF
C500: 00 00 00 00 00 00 00 00 00
C508: 00 00 00 00 00 00 00 00 08
C510: 00 00 00 00 00 00 00 00 10
C518: 00 00 00 00 0A 01 01 13 37
C520: 13 0A 01 0A 13 14 26 01 96
C528: 01 26 26 14 01 14 80 88 A7
C530: 88 88 88 88 88 88 88 01 EC
C538: 07 03 0D 0F 0A 08 0F 05 84
C540: 00 28 50 78 A0 C8 F0 18 A3
C548: 40 68 90 B8 E0 08 30 58 AB
C550: 80 A8 D0 F8 20 48 70 98 B4
C558: C0 00 00 00 00 00 00 00 19
C560: 01 01 01 01 01 01 02 02 6A
C568: 02 02 02 02 02 03 03 03 7B
C570: 03 03 FF FF 00 01 01 01 79
C578: 00 FF 00 01 01 01 00 FF 7B
C580: FF FF 0E 06 07 05 0D 09 B6
C588: 0B 0A 86 82 82 82 86 84 B6
C590: 84 84 80 00 01 FF 00 00 1B
C598: 01 28 29 50 51 00 07 01 94
C5A0: 06 02 05 03 04 01 00 02 B7
C5A8: 07 03 06 04 05 02 01 03 C7
C5B0: 00 04 07 05 06 03 02 04 CF
C5B8: 01 05 00 06 07 04 03 05 D7
C5C0: 02 06 01 07 00 05 04 06 DF
C5C8: 03 07 02 00 01 06 05 07 E7
C5D0: 04 00 03 01 02 07 06 00 E7
C5D8: 05 01 04 02 03 00 00 80 68
C5E0: 19 00 1B 08 00 00 00 00 1D
C5E8: 00 20 00 00 00 00 00 00 09
C5F0: 00 00 00 00 00 8F 05 12 97
C5F8: 40 92 20 20 12 40 92 20 11
C600: 20 12 40 92 20 20 12 40 97
C608: 0D 0D 20 20 9C 42 4F 4E DE
C610: 55 53 20 05 31 30 30 1D 8C
C618: 1D 1D 1D 1D 1D 1D 1D 1D 01
C620: 1D 1D 1D 1D 1D 1D 1D 1D 09
C628: 1D 1E 4C 45 56 45 4C 20 FC
C630: 05 30 30 31 00 50 52 45 AE
C638: 53 53 20 46 49 52 45 20 46
C640: 54 4F 20 50 4C 41 59 20 5B
C648: 41 47 41 49 4E 00 1F B2 7B
C650: C9 D5 C9 B2 C9 B2 C9 B2 65
C658: D5 C9 D5 C9 B2 C9 B2 AE 75
C660: 0D 20 20 20 20 20 20 20 4E
C668: 20 20 20 20 9A AB B3 AB 8E
C670: B3 AB B3 AB B3 C2 C2 20 88
C678: AB B3 C2 C2 AB 0D 20 20 56
C680: 20 20 20 20 20 20 20 20 81
C688: 20 9F B1 CB CB CA BD CA E4
C690: BD CA B1 CA CB CB CA B1 A9
C698: CB B1 BD 00 81 53 45 4C 3A
C6A0: 45 43 54 20 4E 55 4D 42 D0
C6A8: 45 52 20 4F 46 20 52 4F B7
C6B0: 42 4F 54 53 20 97 34 20 F5
C6B8: 35 20 36 20 37 20 38 00 F3
C6C0: 64 64 A0 67 A0 7A 20 64 31
C6C8: 7C A0 20 A0 64 64 62 A0 72
C6D0: A0 6F 64 64 6C A0 6F A0 C6
C6D8: 20 64 75 A0 E2 A0 64 64 BF
C6E0: FC 62 6F A0 64 64 A0 62 1C
C6E8: A0 7A 64 64 7E A0 20 A0 AC
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 67 and 68 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
C6F0: 64 64 A0 7A A0 7A 64 64 B8
C6F8: 4C A0 6F A0 1C 1C 3E 5D C9
C700: 2A 1C 36 63 1C 1C 3E 5D B3
C708: 2A 1C 36 63 1C 1C 18 38 70
C710: 38 1C 38 2C 1C 1C 78 5E D7
C718: 58 1E 72 43 38 38 18 1C E8
C720: 1C 38 1C 34 38 38 1E 7A CD
C728: 1A 78 4E C2 1C 1C 7E 5D DF
C730: 1A 3C 36 06 1C 1C 3F 5D 97
C738: 2C 1E 36 30 3C 66 FF 99 25
C740: 5A 3C 66 E7 00 7E 7E 7E A0
C748: 7E 7E 7E 00 C3
```

IRQ MESSENGER

FROM PAGE 13

MESSENGER64 LOADER

```
·100 REM *** MESSENGER64 LOADER ***        LO
·110 MS=51200:REM WILL RELOCATE            DI
·120 CK=0                                  OL
·130 READD:CK=CK+D:IFD=999THEN150          AG
·140 GOTO130                               KO
·150 IFCK<>26712THENPRINT"ERROR IN DATA":
 END                                       HI
·160 RESTORE                               CM
·170 SA=MS                                 JG
·180 READD:IFD=999THEN230                  AL
·190 IFD=>0THENPOKESA,D:GOTO220            LK
·200 AD=MS+ABS(D):H=AD/256:L=AD-INT(AD/25
 6)*256                                    AN
·210 POKESA,L:SA=SA+1:POKESA,H             FC
·220 SA=SA+1:GOTO180                       BM
·230 AD=MS+63:H=AD/256:L=AD-INT(AD/256)*2
 56                                        KG
·240 POKEMS+38,L:POKEMS+52,L               ME
·250 POKEMS+42,H:POKEMS+54,H               KB
·260 PRINT"MESSENGER INSTALLED"MS"TO"MS+2
 54                                        HP
·270 PRINT"SYS"MS"TO ENABLE"               AE
·280 PRINT"SYS"MS+3"TO SET UP"             BO
·290 END                                   KD
·300 DATA 184,80,27,76,-143,0,0            FI
·310 DATA 0,0,0,0,0,0,0,0                  FP
·320 DATA 0,0,0,0,0,0,0,0                  IF
·330 DATA 0,0,0,0,0,0,120,173              PF
·340 DATA 20,3,172,21,3,201,63,208         PN
·350 DATA 4,192,200,240,16,141,-141        GG
·360 DATA 140,-142,169,63,160,200,141      MO
·370 DATA 20,3,140,21,3,88,96,162          HN
·380 DATA 3,181,251,72,202,16,250,162      FG
·390 DATA 4,202,48,55,188,-26,16           PI
·400 DATA 5,169,0,157,-26,152,41           KF
·410 DATA 15,240,238,138,168,10,170,189    CL
·420 DATA -6,133,251,189,-7,133            JL
·430 DATA 252,189,-14,133,253,189,-15      EG
·440 DATA 133,254,152,170,188,-22          MH
·450 DATA 177,251,145,253,136,192,255,144  BD
·460 DATA 247,240,198,232,104,149,251,232  MN
·470 DATA 224,4,208,248,76,255,255,32      DN
·480 DATA 121,0,240,83,32,241,183,138      DA
·490 DATA 41,124,240,3,76,72,178,134       IA
·500 DATA 174,32,121,0,240,78,32,253       ME
·510 DATA 174,32,138,173,32,247,183,132    OE
·520 DATA 195,133,196,32,253,174,32,235    JD
·530 DATA 183,134,175,165,174,41,3,168     AB
·540 DATA 10,170,120,165,195,157,-6        KO
·550 DATA 165,196,157,-7,165,20,157        PP
·560 DATA -14,165,21,157,-15,152           BJ
·570 DATA 170,165,175,157,-22,165,174      IN
·580 DATA 5,15,157,-26,88,96,169           AM
·590 DATA 0,162,3,120,157,-26,202          MP
·600 DATA 16,250,88,96,165,174,41,3        JI
·610 DATA 170,120,169,0,240,228,999        ED
```

DEMO

```
·100 M$="THIS[SS]IS[SS]THE[SS]TOP[SS]LINE
 ":REM USE SHIFT-SPACE                     MG
·110 L=LEN(M$)                             OC
·120 FORI=1TOL                             BF
·130 C=ASC(MID$(M$,I,1)):POKE828+I-1,C+64  OI
·140 POKE828+L+I,1:NEXT                    OI
·150 SYS51203,2,828,1024,L-1               GO
·160 SYS51203,3,828+L+1,55296,L-1          KO
·170 PRINTTI                               OD
·180 GETA$:IFA$=""THEN170                  DH
```

MESSENGER128 LOADER

```
·100 REM *** MESSENGER128 LOADER ***       LI
·110 MS=3072:REM WILL RELOCATE             IM
·120 CK=0                                  OL
·130 READD:CK=CK+D:IFD=999THEN150          AG
·140 GOTO130                               KO
·150 IFCK<>32371THENPRINT"ERROR IN DATA":
 END                                       PC
·160 RESTORE                               CM
·170 SA=MS                                 JG
·180 READD:IFD=999THEN230                  AL
·190 IFD=>0THENPOKESA,D:GOTO220            LK
·200 AD=MS+ABS(D):H=AD/256:L=AD-INT(AD/25
 6)*256                                    AN
·210 POKESA,L:SA=SA+1:POKESA,H             FC
·220 SA=SA+1:GOTO180                       BM
·230 AD=MS+75:H=AD/256:L=AD-INT(AD/256)*2
 56                                        KP
·240 POKEMS+50,L:POKEMS+64,L               HH
·250 POKEMS+54,H:POKEMS+66,H               LH
·260 PRINT"MESSENGER INSTALLED"MS"TO"MS+3
 44                                        HN
·270 PRINT"SYS"MS"TO ENABLE"               AE
```

```
·280 PRINT"SYS"MS+3"TO SET UP"                BO
·290 PRINT"SYS"MS+6"TO CLEAR A BOX"           GL
·300 END                                      KN
·310 DATA 184,80,39,76,-207,76,-325           GG
·320 DATA 0,0,0,0,0,0,0                       AK
·330 DATA 0,0,0,0,0,0,0,0                     HD
·340 DATA 0,0,0,0,0,0,0,0                     HJ
·350 DATA 0,0,0,0,0,0,0,0                     KH
·360 DATA 0,0,120,173,20,3,172,21             CL
·370 DATA 3,201,75,208,4,192,12,240           LF
·380 DATA 16,141,-205,140,-206,169            AB
·390 DATA 75,160,12,141,20,3,140,21           GF
·400 DATA 3,88,96,173,17,208,48,124           AK
·410 DATA 162,3,181,251,72,202,16,250         JM
·420 DATA 173,170,2,72,173,185,2,72           PO
·430 DATA 169,251,141,170,2,169,253,141       IO
·440 DATA 185,2,162,4,202,48,76,188           FJ
·450 DATA -29,16,5,169,0,157,-29              GO
·460 DATA 152,41,15,240,238,138,168           NB
·470 DATA 10,170,189,-9,133,251,189           PA
·480 DATA -10,133,252,189,-17,133             OP
·490 DATA 253,189,-18,133,254,152,170         FJ
·500 DATA 188,-25,142,-41,189,-33             KC
·510 DATA 170,32,162,2,72,174,-41             AO
·520 DATA 189,-37,170,104,32,175              PI
·530 DATA 2,174,-41,136,192,255,144           EE
·540 DATA 229,240,177,104,141,185,2,104       NN
·550 DATA 141,170,2,232,104,149,251,232       JI
·560 DATA 224,4,208,248,76,255,255,133        BN
·570 DATA 206,134,207,132,219,32,134,3        OI
·580 DATA 240,94,32,15,136,132,195,133        NN
·590 DATA 196,32,92,121,32,3,136,134          HC
·600 DATA 175,165,206,41,127,201,4,144        EF
·610 DATA 3,76,40,125,133,174,165,207         MI
·620 DATA 32,-335,133,207,165,219,32          GI
·630 DATA -335,133,219,165,174,168,10         CN
·640 DATA 120,170,165,195,157,-9,165          FP
·650 DATA 196,157,-10,165,22,157,-17          CP
·660 DATA 165,23,157,-18,152,170              GM
·670 DATA 165,207,157,-33,165,219,157         PK
·680 DATA -37,165,175,157,-25,165             OP
·690 DATA 206,9,15,157,-29,88,96              FP
·700 DATA 169,0,162,3,120,157,-29             DA
·710 DATA 202,16,250,88,96,201,4,176          FI
·720 DATA 168,170,120,169,0,240,228,201       GI
·730 DATA 16,176,158,170,76,107,255,999       IO
```

DEMO

```
·100 GRAPHIC3,1:SLEEP2                        EO
·110 FORI=0TO31                               BN
·120 SYS3075,2OR128,15,15,0,16384+I*256,8
 192+I*256,255:NEXT                           EN
·130 SLEEP2                                   LO
·140 GRAPHIC0                                 JO
·150 END                                      BG
```

COMMODARES

Continued from page 52

```
30 FOR A=1 TO 10
40 FOR B=1 TO 2
50 NEXT B
60 NEXT A
```

This still makes me scratch my head. How can two $750 raises per year be a better choice than one $3000 raise per year? I guess the proof is in the program. I'll continue to contemplate this while you get busy with next month's challenges. Keep those problems and solutions coming. □

Congratulations also to the following readers not already mentioned with valid solutions to *Commodares:*

Bruce Barley (Wichita, KS)
Sean Bates (N. Stonington, CT)
Jason Boche (Inver Grove Heights, MN)
Necah Buyukdura (Ankara, Turkey)
Rob Henry (Cleveland, OH)
Kenneth Holt
John Locke (Central Pt., OR)
Steve Moon (Duluth, MN)
James Schuster (Fairpoint, OH)
James Sethman (Linden, NJ)
Timothy Slate (Brattleboro, VT)
Bill Watkins (Tampa, FL)

TIPS AHOY!

Continued from page 30

```
·50 POKE53272,(PEEK(53272)AND240)OR12
·60 FORY=0TO5:FORX=0TO7:POKE12544+X,A(Y,X
 ):IFPEEK(203)=64THENNEXT:NEXT:GOTO60
·70 FORX=0TO7:POKE12544+X,0:NEXT:END
·80 DATA 255,129,129,129,129,129,129,255,
 0,126,66,66,66,66,126,0,0,0,60,36,36,60
·90 DATA 0,0,0,0,0,24,24,0,0,0,0
```

FAST RENUMBER

Much time is saved on long, complex programs if the C-128's RENUMBER command is used in FAST mode, but because the screen's blank, you don't know when it's finished. This convenient F-key definition makes a FAST renumber simple.

```
·10 KEY1,"[4"[DOWN]"][UP]SLOW[3"[UP]"][4"
 [LEFT]"]FAST:POKE842,13:POKE208,1:RENUMB
 ER"
```

The F-key prints the FAST... line, prints SLOW three lines down, and loads the keyboard buffer with a RETURN. Note: if done at screen bottom, (4DN)(UP) prevents SLOW from being scrolled offscreen if the RENUMBER values extend to the next line.

When the numbers are entered and RETURN is pressed, the screen goes blank until the RENUMBER is done. Then, the stored RETURN enters the SLOW and the screen is back. Warning: an aborted RENUMBER (UNRESOLVED REFERENCE ERROR, e.g.) leaves it in FAST mode. If it seems to be taking far too long, enter SLOW manually to find out.

—Bob Renaud
Washington, MA

GET THE GLOW

Here's an interesting machine language program that makes the screen "glow." The program works even when another one is running. The glow is more evident on a monochrome monitor.

—Dailah Hodge
St. Croix, U.S.V.I.

```
•5 FORT=49152 TO 49269:READA:POKET,A:S=S+
A:NEXT
•10 IFS<>10540THENPRINT"ERROR IN DATA":EN
D
•15 SYS49152
•100 DATA 120,169,021,141,020,003,169,192
,141,021,003,160,000,140,084,192,140
•105 DATA 086,192,088,096,172,084,192,200
,140,084,192,192,003,208,049,160,000
•110 DATA 140,084,192,172,086,192,185,087
,192,162,000,157,000,216,157,000,217
•115 DATA 157,000,218,157,000,219,141,134
,002,232,208,238,169,000,141,032,208
•120 DATA 141,033,208,200,192,030,208,002
,160,000,140,086,192,076,049,234,000
•125 DATA 000,000,006,009,011,002,008,004
,014,012,010,005,003,015,007,013,001
•130 DATA 001,013,007,015,003,005,010,012
,014,004,008,002,011,009,006,000
```

BOXES

Boxes is a neat little subroutine that makes creating menu, gaming, or input boxes simple. Just assign values to W, H, D, and R—W meaning width, H meaning height, D meaning rows down and R meaning spaces right. —C. Pickrell
Manteca, CA

```
•10 PRINT"[CLEAR]";"[WHITE]";
•20 W=10:H=5:D=5:R=20:GOSUB60
•30 W=5:H=10:D=3:R=5:GOSUB60
•40 W=20:H=2:D=10:R=4:GOSUB60
•50 W=3:H=15:D=1:R=24:GOSUB60
•55 PRINT"[HOME]";:END
•60 PRINT"[HOME]";
•70 FORX=1TOD:PRINT"[DOWN]";:NEXT
•80 FORX=1TOR:PRINT"[RIGHT]";:NEXT
•90 W=W-2:PRINT"[s O]";
•100 FORX=1TOW:PRINT"[c Y]";:NEXT
•110 PRINT"[s P]"
•120 FORX=1TOH:PRINTTAB(R);"[c G]";SPC(W)
"[c M]":NEXTX
•130 FORX=1TOR:PRINT"[RIGHT]";:NEXT
•140 PRINT"[s L]";
•150 FORX=1TOW:PRINT"[c P]";:NEXT
•160 PRINT"[s @]"
•170 RETURN
```

CURTAINS

Want to spruce up your title and menu screens a bit? Or maybe you want to add a little variety when your programs perform screen changes. For a little zip, try *Curtains*.

Curtains gives the illusion of a curtain lowering, then rising back up. Whenever your program is going to have a screen, menu, or title change, have it activate *Curtains* for a nice touch.

You can append *Curtains* to your own programs and have them run the loader to POKE the data into memory. Whenever you want a *Curtain* call, have your program SYS 700. For example:

```
100 SYS 700
```

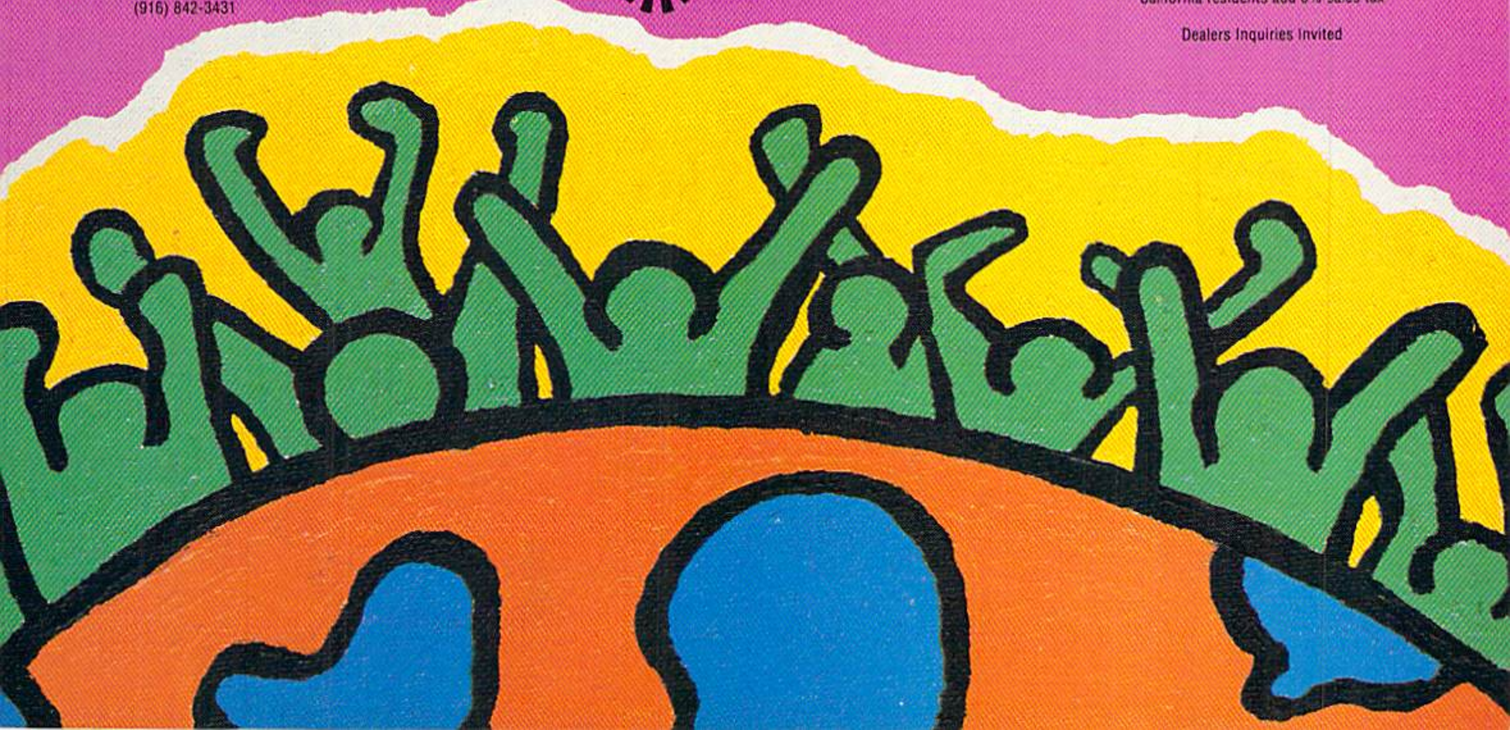
The curtain color is the same as the current printing color. So for best results, have all the characters the same color whenever you call it.

For a quick demonstration, run the loader. Now type SYS 700 and press RETURN. It's *Curtains!*

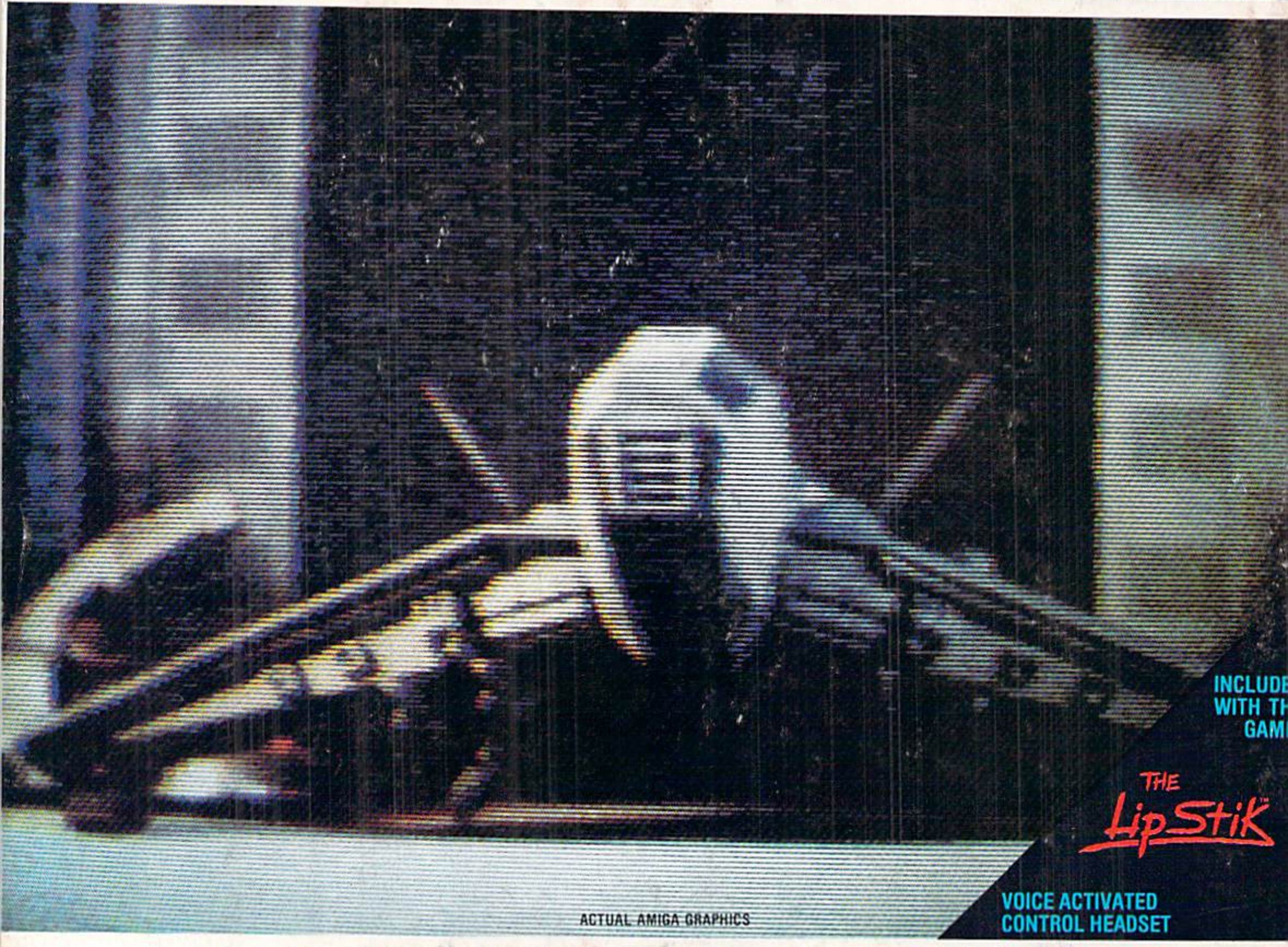
Curtains can be relocated by changing the variable A in line 1. Be certain that you SYS to the new address if you do change it.

—Buck Childress
Salem, OR

```
•1 A=700
•2 FORB=ATOA+61:READC:POKEB,C:D=D+C:NEXTB
•3 IFD<>10475THENPRINT"ERROR IN DATA[3"."
]":END
•4 DATA173,33,208,162,0,133,251,134,252,1
34,253,173
•5 DATA134,2,141,33,208,165,253,208,7,230
,252,230
•6 DATA252,184,80,4,198,252,198,252,173,1
8,208,197
•7 DATA252,144,249,165,251,141,33,208,173
,18,208,208
•8 DATA251,165,252,208,214,230,253,165,25
3,201,2,144,206,96
```



ECHELON™



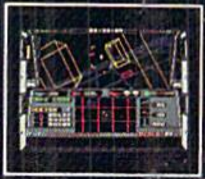
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